Preface

This is the third edition of EGEA, the International Conference on the Health Benefits of a Mediterranean Style Diet. Progressively, this Conference is taking an important place at the crossroads of scientific evidence and health prevention actions. The aim is to establish a consensus on an effective strategy to prevent and control chronic diseases such as obesity, diabetes, cardiovascular diseases and cancer, which are becoming, according to the World Health Organization, leading causes of morbidity and mortality around the world. Like infectious diseases, these chronic diseases could be, and should be, prevented and controlled on a mass scale by the preservation or creation of healthy environments, including healthy food systems. Such prevention, however, faces difficulties stemming from the diversity and economic consequences of the environmental factors involved, including the changing nature and quality of food supplies, food advertising, marketing, promotion and food pricing. With the increasing number of meals taken away from home, time limitations of consumers, … the food industry has responded by increasing the number of convenience foods and the availability of prepared meals, together with an increase in portion sizes and per capita availability of fat and added sugar. EGEA constitutes a unique and valuable opportunity for the convergence of multidisciplinary approaches, from basic science, health, agriculture, communication, to global prevention politicies. Two round tables are being organized to share experiences on various strategies available and to define guidelines for health nutrition policies which could be implemented at the general population level. With the participation of the best world specialists on these issues, the support of the French and Italian Ministries of Health and IARC-WHO, this conference is fully in line with the global strategy of the World Health Organization concerning nutrition, physical activity and health. It is my sound conviction that this conference will again be a success story!

Pr Ambroise MARTIN
Professor of Nutrition, University of Lyon,
member of the steering committee
of the French national nutrition health policy

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Wednesday May 18th 2005

16h00 — **Registration**

17h00 — **opening**

L. Damiens : *Director of Aprifel*
S. Barnat : *Head of the Scientific Department of Aprifel - EGEA Scientific Coordinator*

Scientific opening

R. Marabelli : *Director General Veterinary Public Health, Food and Nutrition - Ministry of Health (Italy)*
F. Romano : *President of INRAN - National Institute for Research on Food and Nutrition (Italy)*
D. Greco : *Director General of Health Prevention - Ministry of Health (Italy)*
E. Riboli : *Head, Nutrition and Hormones Group of International Agency for Research on Cancer (IARC-WHO)*

19h00 — **Opening Cocktail** at the French Embassy **«Palazzo Farnese»**

Special invitation from his Excellency **Loïc Hennekinne**

Programme

Thursday May 19th 2005

Session 1
MEDITERRANEAN TYPE DIET / METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

09h00 **Obesity**
Co - chairmen : *B. Rolls (USA) & M. Carruba (Italy)*

Introduction : *M. Carruba (Italy)*
Dietary energy density as a guide to food choices and weight management : *B. Rolls (USA)*
Optimal dietary strategies for weight management : *A. Astrup (Denmark)*
Obesity, socio-economic status and food intake in children : *M. Hetherington (UK)*
Prevention of obesity: is it ever too late to start? : *J. Seidell (The Netherlands)*
Conclusion : *B. Rolls (USA)*

11h10 **Fruit and coffee break**

11h30 **Diabetes**
Chairman : *N. Wareham (UK)*

Observational studies of dietary factors and the metabolic or insulin resistance syndrome *: N. Wareham (UK)*
Diet and type 2 diabetes from observational studies : *F. Hu (USA)*
Dietary interventions and the metabolic syndrome : *D. Giugliano* (*Italy*)
Dietary interventions and risk of type 2 diabetes : *J. Tuomilheto* (*Finland*)

13h30 **Lunch**

14h30 **Cardiovascular diseases (CVD)**
Chairman : *S. Panico (Italy)*

Cardiovascular risk, n-3 PUFA, and dietary habits after myocardial infarction: the GISSI - Prevention study : *R. Marchioli (Italy)*
Changing dietary patterns reduces CVD risk - Evidence from primary prevention trials : *E. Feskens (The Netherlands)*
Mediterranean diet and CVD: beyond Cholesterol : *A. Rivellese (Italy)*
Cardiovascular disease preventable fraction in the population through adherence to Mediterranean diet : *S. Panico (Italy)*

16h15 **Fruit and coffee break**

16h45 **Cardiovascular diseases (CVD)**
Chairman : *G. Berglund (Sweden)*

CVD Diet visavi other CVD risk factors : *G. Berglund (Sweden)*
Energy and fat intake and CVD risk : *M. Leosdottir (Iceland)*
Results from the EPIC Heart : *R. Saracci (Italy)*
Dietary patterns and risk of CVD : *M. Schulze (Germany)*

18h35 **END**

Programme

Friday May 20th 2005

9h00	**D. Bussereau, The French Minister of Agriculture, Food, Fisheries and Rural Affairs**
09h30	**Cancer** Chairman : *E. Riboli (IARC - WHO)* Where do we stand in the search for the nutritional causes of cancer? : *E. Riboli (IARC - WHO)* Nutrition, steroid hormones and breast cancer : *F. Berrino (Italy)* Diet, obesity, physical activity and colorectal cancer : *T. Norat (France)*
10h50	**Fruit and coffee break**
11h15	Vegetarianism and cancer risk : *T. Key (UK)* Mediterranean diet and cancer risk : *D. Palli (Italy)* Discussion and conclusions : *E. Riboli (IARC - WHO)*
12h45	**Lunch**
	Session 2 **FROM SCIENTIFIC EVIDENCE TO HEALTH PREVENTION ACTIONS** Moderator : *E. Riboli (IARC - WHO)*
14h30	**Round Table 1 - Actions: What Can Be Done To Change Behaviour?** Communication : *L. Damiens (France)* Promoting fruit & vegetables through schools - A European perspective : K.I. Klepp (*Norway*) The Fruit and Vegetable Snack Program in the United States: a Case Study in Policy Development : *L. Di Sogra (USA)* Effective and sustainable worksite-based interventions to promote fruit and vegetable consumption in adults : *M. Meyer (Denmark)* The five colors forr well-being: opportunities for consumers and producers : *F. Marzano (Italy)*
15h45	**Fruit and coffee break**
16h15	**Round Table 2 - How Politics Are Involved? Can Public Strategies Be Developed?** How politics are involved? Can national nutrition policies be developed? The case of Italy : *D. Greco (Italy)* Public Health Nutritional Policy in France : *S. Hercberg (France)* Changing behaviour and environment requires statutory measures : *JM. Le Guen (France)* How politics are involved? Can national nutrition policies be developed ? The case of Greece : *A. Trichopoulou (Greece)* Finnish experience on national policies and strategies for chronic disease prevention : *P. Pietinen (Finland)* Community action on nutrition and physical activity : *W. Kamphausen (DG Sanco – EU)* Closure by *A. Trakatellis* (European Parliament, Vice-President)
18h30	**END**

Programme

Saturday May 21st 2005

09h00 — **Poster Session**
Chairman : *A. Drewnowski (USA)*

10h00 — **Fruit and coffee break**

Session 3
TOWARD NATURALLY NUTRIENT-RICH SNACKS:
Global Trends in Snacking Behaviour
Chairman : *A. Drewnowski (USA)*

10h30
Nutrient density as a tool for health promotion: introducing the Naturally Nutrient Rich (NNR) Index *A. Drewnowski (USA)*
Predictors of fruit and vegetable consumption by children : *J. Wardle (UK)*
Snacking and obesity : *S. Jebb (UK)*
Metabolic response to snacks : leptin, ghrelin and insulin : *D. Chapelot (France)*

12h30 — **Conclusion EGEA 3**
E. Riboli (IARC-WHO)
L. Trentini (President AREFLH)

13h00 — **END**

OPENING

BIOGRAPHY

Laurent DAMIENS

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BIOGRAPHICAL SKETCH

Dr Laurent Damiens obtained in 1985 a Master of Business Administration in the University of Paris 9 Dauphine, and then a PhD in strategy, marketing and communication on " post-modern marketing" in the University of Paris 9 - Dauphine.

In 1986 he started working for Cartier in New-York (USA) in charge of marketing development and strategic communication.

In 1992 he started a new position for Sopexa, the French agency in charge of promoting the French food & wine all over the world. He was in charge of the fruit & vegetable sector for more than 4 years and then took the challenge to promote the French art of eating into Japan, and moved to Tokyo.

Since1999, he is the general director of Aprifel, the agency for research & information on fruit & vegetables, based in Paris. He developed the "fresh'attitude" concept, and created the "10 a day" strategy to promote the consumption fruit & vegetables. He also opened in 2001 an art gallery in Paris, la galerie fraich' attitude, centred into the concept of the eat art movement. The Gallery Fraich'attitude is now well recognised and proposes to the public exhibitions on specific artists or food themes, food design and contemporary creation.

Laurent Damiens is a fast&junk food fighter, and is dedicated to promoting a neo-vegetarianism lifestyle to interrupt the industrial abuse in our food, a tendency which has accelerated greatly in the past ten years. Giving meanings back to our foodstuffs, with the individual's total implication as a creator of emotions, through the daily act of cooking at home. Rethinking the way we eat, stimulating emotion through the use of cooking, creating, through taste, forms, textures, senses, colours and odours : rediscovering rich, deep sensations, as when one is creating and feeling, through the act of eating.

Saida BARNAT

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BIOGRAPHICAL SKETCH

Saida Barnat has a Ph.D. in Human Nutrition, University of Paris VI, 1986.

In 1999, she was appointed head of the Scientific Department of Aprifel in Paris. Her main purpose is to coordinate among scientists, health professionals, the media and fruits & vegetables professionals.

Her fields of study include fruits & vegetables and their safety. She is the coordinator for the Aprifel Board of Scientific Experts for safety related matters.

She is also the scientific coordinator of Egea, the International conference on health benefits of the Mediterranean diet which took place in Crete (Greece) in 2003 and in Perpignan (France) in 2004.

Dr Saida Barnat spent 4 years at the Environmental Medicine Institute as a manager for the Nutrition and Toxicology Department where she worked on carcinogenic compounds (such as heterocyclic amines) and food-related allergies (celiac disease).

She spent 10 years at the Cancer Research Institute of the National Scientific Research Center (CNRS) in Paris where she worked on toxicological issues related to mycotoxins and antibiotics.

SCIENTIFIC OPENING

BIOGRAPHY

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BIOGRAPHICAL SKETCH

Doctor in Veterinary Medicine, University of Milan, 1979; Ph.D. in Food Hygiene and Technology, Milan, 1981;

Ph.D. in Veterinary Legislation, Milan, 1983; -Ph.D. in Veterinary Public Health, Milan, 1987; Since 1991 Director General of the Department for Food, Nutrition and Veterinary Public Health;-First Secretary for Health Issue at the Italian Permanent Representation of Italy c/o the EEC in Brussels, 1984/1989;

Deputy Councillor of the Ministry of Health, 1988; -Councillor for the Ministry of Foreign Affairs for Health Matters at the Italian Permanent Representation c/o the EEC in Brussels, 1990/1991;

Professor in charge of Food Hygiene at the Post-Graduate Veterinary School of the University of Milan, 1986-2004; Parma, 1988/9,1991/92 Pavia, 2004;

Organiser of the Group of EU Chief Veterinary Officers during the Italian Presidencies in 1985 and 1990; 1996-2003; -President of the Executive Council of the FAO/OMS European Commission against foot-and-mouth disease (EUFMD) since 1993, from 1997 to 2001;-Vice-President of the European Agency for the Evaluation of Medicinal Products (EMEA) since 23 June 1994, re-elected in 1997;–President of the Office International des Epizooties (O.I.E) in Paris since May 2000.

RECENT PUBLICATIONS

> A.Mantovani….**R. Marabelli**… "The Multidisciplinary Approach to the great Plague in Italy", Deutische Veterinarmedizinische Gesellschaft e V., pp.76-80, 1998;
> V. Caporale, **R. Marabelli**, G.L.Fiore "Judging Equivalence of standards in meat inspections programs; an importing countries perspective" World Congress on Meat and Poultry Inspection in the next Century, De Ruwenberg, The Netherlands, 10,1997;
> **R. Marabelli** … "Veterinary and food policies during the semester of Italian Presidency of the EU", Il Progresso Veterinario,15/96, pp.516-519;
> **R. Marabelli** "Organisation and Management of Veterinary Public Health in Italy and in Europe"on Argomenti, 11,2001.
> **R. Marabelli** "The role of official Veterinary Services in dealing with new social challenger: animal health and protection, food safety, and the environment", Revue scientifique et technique OIE, vol. 22,2003, pp.263-271.

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BIOGRAPHICAL SKETCH

Ferdinando Romano has a Medical Degree (MD), 1981, Degree of Specialization in Hygiene and Preventive Medicine, 1985 and Master of Science (MS) In Epidemiology, 1987.

Full Professor of Hygiene at the University of Rome "La Sapienza".

President of the National Institute for Reserch on Food and Nutrition (INRAN).

Member of the National Committee for Health Research – Ministry of Health.

Member of the Consulting Committee for Food Safety – Ministry of Health. Member of the National Committee for Strategic Planning and Evaluation of Research – Ministry of Education and Research.

Member of the Organizing Board - National Research Council.

He has published more than 95 scientific papers in National and International scientific journals.

RECENT PUBLICATIONS

> Manzoli L, **Romano F**, …, Pirone GM. Attuali evidenze epidemiologiche in tema di radiazioni ionizzanti a basse dosi ed implicazioni in tema di radioprotezione, sanità pubblica e medicina legale. Igiene e Sanità Pubblica 2004;(1-2):81-102.
> Manzoli L, …, **Romano F**, Staniscia T. Use of hormone replacement therapy in Italian women aged 50-70 years. Maturitas 2004;49:241-51.
> Manzoli L, …, **Romano F**, Gonnella JS. Use of Disease Staging and analysis of untimely admissions in the Abruzzo Region, Italy: implications for clinical management. Italian Journal of Public Health 2004;1:55.
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> D'Antonio D, …, **Romano F**. Addition of teicoplanin or vancomycin for the treatment of documented bacteremia due to gram-positive cocci in neutropenic patients with hematological malignancies: microbiological, clinical and economic evaluation. Chemotherapy. 2004;50(2):81-7.
> Manzoli L, Romano F, …, Gonnella JS. On the use of Disease Staging for clinical management: analysis of untimely admissions in the Abruzzo Region, Italy. Italian Journal of Public Health 2004;1(3-4):103-7.

BIOGRAPHY

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BIOGRAPHICAL SKETCH

Dr Donato Greco is graduated in Medicine and Surgery, University of Naples (1971) with Specializations in Infectious, tropical and Subtropical diseases, (1974), Preventive Medicine and Hygiene (1977), University of Naples and Medical Statistics, University of Rome (1982).

He is Director General of Health Promotion, Ministry of Health since 2004.

He was Director of the Communicable Disease Unit, Laboratory of Epidemiology, Istituto Superiore di Sanità,Rome (1983-96); Director of Research, Epidemiology of Communicable Disease, Istituto Superiore di Sanità, Rome (1984-2004); Director, National AIDS Operational Centre, ISS, Rome (1987-1993); Director, Laboratory of Epidemiology and Biostatistics, Istituto Superiore di Sanità (1996-2003); Director, National Centre for Epidemiology, Surveillance and Health Promotion, Istituto Superiore di Sanità (2003-2004).

He has been a member of several European and Italian Commissions since 1983 to date.

Dr Greco is a member of several Professional Organizations: International Epidemiological Society; National epidemiological association; National Hygiene Society (SITI); Royal Institute of Public Health London.

He was an Expert, in the WHO Bacterial Disease advisory board between 1984 and 2002 in Geneva.

He was Director of the WHO Collaborating Centre for Health and Disease Surveillance, Istituto Superiore di Sanità, Rome from 1984 to 2004.

Dr Greco developed many professional and personal relationships with most of the countries in the EU accession list.

On behalf of the Italian Health Authorities, WHO, and European community Dr Greco conducted several evaluation activities in health systems specially in the field of Communicable diseases in several countries, including some East European countries (Turkey, Uzbekistan, Kosovo, Albania), and in many Italian Regions.

Dr Greco published more than 100 international scientific papers.

Elio RIBOLI

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BIOGRAPHICAL SKETCH

Dr Riboli has an M.D. degree (1977, Milan), a Master of Public Health (1980, Milan) and a Master of Science in Epidemiology (1982, Harvard, Boston, USA).

In 1983 he moved to IARC-WHO in Lyon, where he undertook the task of developing new research projects in the area of nutrition, nutritional status and cancer. In 1989 he initiated the European Prospective Investigation into Cancer and Nutrition (EPIC), which eventually included 26 centres in 10 European countries. Questionnaire date on diet and lifestyle have been obtained from about 500,000 study subjects, and blood samples from most of them.

He is now Head of the Nutrition and Hormones Group of IARC, whose main object will be follow-up of EPIC over the next decade and research into the role of nutrition, lifestyle, environment, genetics and metabolic and hormonal factors in cancer etiology.

RECENT PUBLICATIONS

> Jenab M, Ferrari P, Slimani N, Norat T, … , **Riboli E**. Association of nut and seed intake with colorectal cancer risk in the European prospective investigation into cancer and nutrition. Cancer Epidemiol Biomarkers Prev 2004 ;13(10):1595-603.
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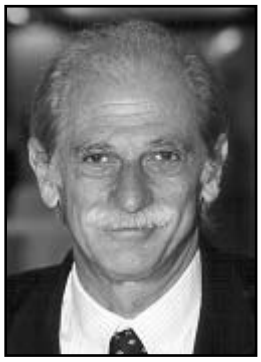
Session 1 :
MEDITERRANEAN TYPE DIET /
METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

OBESITY

Co-Chairmen
B. Rolls
M. Carruba



Michele O. CARRUBA

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BIOGRAPHICAL SKETCH

Doctor Michele Carruba has a Degree in Pharmacy, 1968; Speciality in Pharmacology, 1970 and a Degree in Medicine and Surgery (M.D.), 1981.

He is Full Professor of Pharmacology at the University of Milan, Director of the Center for Study and Research on Obesity and of the Division of Pharmacology at LITA, Vialba.

He is President of the Italian Society of Obesity (SIO) and member of the board of Italian Society of Pharmacology (SIF).

He was a member of Consiglio Superiore di Sanità and President of Committee on Feeding, Life Styles and Health of Italian Ministry of Health.

He has published more than 250 papers in the field of obesity published in scientific journals.

Dr Carruba is coordinator of the PhD in Experimental Pharmacotherapy. Chairman of International Scientific Meetings and Conferences.

RECENT PUBLICATIONS

> Nisoli E,... , **Carruba MO**, Moncada S, Clementi E. Mitochondrial biogenesis by NO yields functionally active mitochondria in mammals. Proc Natl Acad Sci U S A. 2004;101:16507-16512.
> Nisoli E, **Carruba MO**. Emerging aspects of pharmacotherapy for obesity and metabolic syndrome. Pharmacol Res 2004;50:453-469.
> Nisoli E, Clementi E, Moncada S, **Carruba MO**. Mitochondrial biogenesis as a cellular signaling framework. Biochem Pharmacol 2004;67:1-15.
> Nisoli E,... , **Carruba MO**. Mitochondrial biogenesis in mammals: the role of endogenous nitric oxide. Science 2003;299: 896-899.
> Nisoli E,... , **Carruba MO**, Hotamisligil GS. Tumor necrosis factor alpha mediates apoptosis of brown adipocytes and defective brown adipocyte function in obesity. Proc Natl Acad Sci U S A. 2000; 97: 8033-8038.

Introduction

Michele O. Carruba, Center for Study and Research on Obesity, University of Milan, Italy

We are all familiar with the term 'obesity', nevertheless few of us see it as a real disease but an aesthetic problem. Two essentially polar explanations characterize most views on the causes of human obesity. One view suggests that obesity is the result of a fundamental lack of discipline on the part of affected individuals. This view is undoubtedly advanced by the diet industry which has a financial interest in promoting the notion that the only thing separating an individual from his or her 'dream' physique is the implementation of a few simple nostrums. Although it is true that reducing weight does improve the health of obese and overweight individuals, such remedies fail in the vast majority of cases. Thus more than 90% of individuals who lose weight by dieting eventually return to their original weight. The alternative view suggests that body weight (or more precisely, the amount of body fat) is physiologically controlled and that deviations in weight in either direction elicit a potent counter-response that resists that change. Implicit in this view is the notion that biological factors determine each individual's body mass, be they lean or obese, and that this state is then defended.

But this situation is blocking: it is time to go ahead. We must learn to consider obesity and related disorders, i.e. metabolic syndrome, not only as fat accumulation and body weight and waist circumference increases, but clinical situations that boost the global cardiovascular risk. Also therapeutic approaches must be directed to improve this risk not only to reduce fat and body weight.

Ten years ago, leptin was identified as the protein responsible for suppressing appetite. It was hailed as a potential wonder drug and catapulted obesity research to the forefront of biomedical science and public imagination. Yet today, in the developed world the incidence of obesity is rising, and there are now as many obese people in the world as there are people suffering from hunger. The financial burden, health risks and impact on quality of life associated with this epidemic warrant a detailed understanding of the molecular mechanisms that regulate body weight, in order to identify new treatments. A public-awareness campaign, dubbed 'small steps', should try to educate people by highlighting healthier lifestyle options, such as walking up stairs instead of taking a lift. But physicians ought to measure and communicate to their patients a new value to add to BMI, waist circumference, and body weight: the cardiovascular risk value. This can be measured, and a therapeutic approach must be able to lower this value also a bit to improve quality and expectancy of life. Thus, to this approach our obese patients have to be instructed.

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BIOGRAPHICAL SKETCH

B.J Rolls obtained a B.A. in biology from the University of Pennsylvania and a Ph.D. in physiology from the University of Cambridge, England.

She held a number of fellowships at the University of Oxford. In 1984, she moved to the Johns Hopkins University School of Medicine as a Professor of Psychiatry. In 1992, she moved to the Pennsylvania State University as a Professor of Nutritional Sciences and occupant of the Guthrie Chair in Nutrition. She is Past-President of both the Society for the Study of Ingestive Behavior and the North American Association for the Study of Obesity.

She was the recipient of a number of awards including: the American Society of Nutritional Sciences Award in Human Nutrition, a MERIT award from the National Institute of Diabetes and Digestive and Kidney Diseases, the International Award for Modern Nutrition, and Honorary Membership in the American Dietetic Association.

Dr Rolls research interests include the controls of food and fluid intake, especially as they relate to obesity, eating disorders, and aging.

RECENT PUBLICATIONS

> Kral, T.V.E., Roe, L.S. and **Rolls, B**.J. Combined effects of energy density and portion size on energy intake in women. American Journal of Clinical Nutrition 2004;79:962-968.
> **Rolls, B**.J., Roe, L.S. and Meengs, J.S. Salad and satiety: energy density and portion size of a first course salad affect energy intake at lunch. Journal of the American Dietetic Association 2004;104:1570-1576.
> **Rolls, B**.J., Ello Martin, J.A. and Tohill, B.C. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management ? Nutrition Reviews 2004; 62:1-17.
> Tohill, B.C., Seymour, J., Serdula, M., Kettel-Khan, L. and **Rolls, B**.J. What epidemiologic studies tell us about the relationship between fruit and vegetable consumption and body weight. Nutrition Reviews 2004; 62:365-374.
> **Rolls, B**. (2005). The Volumetrics Eating Plan. HarperCollins Publishers, New York.

Dietary energy density as a guide to food choices and weight management

Barbara J. Rolls, Department of Nutritional Sciences, The Pennsylvania State University, University Park, PA 16802, USA

Balancing energy intake with energy expenditure is the key to maintaining a stable body weight. To promote adherence, it is important to choose foods that help control hunger and enhance satiety during caloric restriction. Laboratory-based studies, clinical trials, and epidemiologic data demonstrating the role of the energy density (kJ/gram) of foods in satiety and weight management will be presented.

Fat increases the energy density of many foods; however, the component of food that has the greatest impact on energy density is water. Since water adds weight and volume with no calories, it lowers the energy density, even of high-fat foods. Studies show that when preloads with a high water content and low energy density such as soups or salads are consumed, satiety is enhanced and overall energy intake at the meal is reduced. The key is consumption of foods high in water content, simply drinking water along with food has little impact on satiety.

A number of studies show that a reduction in the energy density of foods also affects *ad libitum* consumption (satiation). For example, when the energy density of mixed dishes such as pasta and casseroles is varied by the addition of water-rich vegetables, people tend to eat a consistent weight of food, and therefore consume fewer calories of the lower energy-dense foods.

Reducing the energy density of the total diet is a nutritionally sound strategy for the management of body weight since it can be accomplished through increased consumption of water-rich vegetables, fruits, soups, and cooked whole-grains, and a reduction in the fat content of foods. A diet lower in energy density allows consumers to eat satisfying amounts of food, while reducing energy intake. The WHO recommended reducing the energy density of the diet as a viable strategy to stem the global obesity epidemic.

We have recently tested the influence of variations in energy density on body weight in two separate year-long clinical trials. In one study, men and women who added two servings of low-energy-dense soup to an exchange-based, calorie-restricted diet lost significantly more weight than those who added a similar number of calories as energy-dense snacks such as pretzels and crackers.

In the other study, we tested the effectiveness of two strategies to reduce the energy density of the diet on body weight over a year. One group was counseled with positive messages to increase intake of water-rich foods and to choose reduced-fat foods. The other group was counseled with more restrictive messages focusing on eating less fat and limiting portions. No limits for energy or fat intake were assigned; subjects were instructed to eat *ad libitum* amounts of food while following the principles of their diet. Both groups were successful in lowering the energy density of their diets. Subjects in both groups lost significant amounts of weight and kept most of the weight off over the year. After both 6 and 12 months the group counseled to eat more fruits and vegetables had lost significantly more weight than the group told to eat less fat. Both strategies for reducing the energy density of the diet resulted in weight loss without counting calories or fat grams. While more long-term interventions are required to understand the impact of reduced energy density diets on weight management, these initial findings are promising.

Further insights on the association of low-energy-dense diets with both diet quality and body weight are coming from large scale population surveys. While calculating dietary energy values in large groups of free-living individuals is challenging, a detailed methodological description has been provided by Ledikwe et al using data from the 1994-96 Continuing Survey of Food Intake by Individuals (CSFII). With this nationally representative U.S. sample, it was shown that persons in the lowest tertile of energy density, based on food intake, reported the lowest energy intakes, while consuming the greatest amount of food by weight.

These survey studies of free-living individuals support laboratory-based data, indicating that low-energy-dense diets are associated with lower energy intakes and higher food weight. Furthermore, the lower-energy-dense diets were associated with lower body weights. Analyses of the CSFII data indicate that individuals with a low-energy-dense eating pattern had mean body mass index values that were lower than persons with a high-energy-dense diet, after controlling for potential covariates including sex, age, and race/ethnicity. An additional benefit of having a diet with a low energy density is improved diet quality. In the CSFII survey, those individuals in the low-energy-density group had higher intakes of fruits and vegetables as well as fiber, vitamin A, vitamin C, and folate.

A growing body of laboratory-based, clinical, and epidemiological data suggests that low energy-density diets high in water- and fiber-rich foods, such as fruits and vegetables, are associated with reduced energy intakes and body weight, and better diet quality.

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He has received The IASO André Mayer Award, the Mölyncke Quality of Life Award, and the 2002 Danone Chair in Nutrition at The University of Antwerp in recognition of his scientific achievements. Arne Astrup was made Knight of the Order of Dannebrog in 1999.

His main areas of interest include the physiology and pathophysiology of energy and substrate metabolism, with a special emphasis on the etiology and treatment of obesity.

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Optimal dietary strategies for weight management.

Is there a need for the Atkins, Zone, and South Beach diets, and the Inverted Food Pyramid?

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Low energy diets

The currently recommendations for the prevention of weight gain and obesity consist of a diet that is low fat, high protein, and fibre rich, with low energy density carbohydrates and restriction of energy containing drinks, and is implemented in combination with gradually increasing daily physical activity. This program has been shown to reduce all risk factors for cardiovascular disease in obese subjects, and to reduce the incidence of type 2 diabetes.

Very restrictive low-carb diets

The Atkins diet, and other low-carb diets, have become extremely popular worldwide and claim to be very effective in promoting weight loss without energy restriction. The dietary principle is ad libitum intake of high protein and high fat foods, and restriction of carbohydrate intake to less than 30 g per day. Recent randomised trials show that such low carbohydrate diets do indeed induce weight loss and improve cardiovascular risk factors in the short term. Much of the weight loss may be loss of glycogen and water, but it is also likely that the high satiating power of protein in combination with the ketogenic effect of the low carbohydrate content can reduce the spontaneous caloric intake and produce weight loss. While beneficial improvements in blood lipids and insulin sensitivity are seen as long as weight loss occurs, the high intake of saturated fat is likely to result in an adverse effect on LDL-cholesterol and other cardiovascular risk factors during weight stability. Adverse effects such as headache, muscle cramps, and diarrhoea are reported more frequently on low carbohydrate than on low fat diets.

High-protein diets

Other diet principles, such as The Zone, Montignac, and the South Beach Diet, are less carbohydrate restrictive, but might produce a weight loss through a high protein content (30-50% energy), in combination with restrictive dietary choices and low glycemic index foods. There seems to be good evidence to support the hypothesis that increasing the protein content of the diet from 15% up to 20-30% may increase the satiating effect of the diet, and induce a spontaneous weight loss without adverse effects.

Higher-fat diets with normal protein contents

Results from large prospective epidemiological diet studies, e.g. "The Nurses Health Study", suggest that current official dietary recommendations are not optimal for the prevention of diet related diseases, such as obesity, type 2 diabetes, cardiovascular disease and cancer. Observational epidemiological studies suggest that optimal recommendations should include more wholegrain products with low glycemic index, more vegetable oils, nuts, beans, poultry and fish, and this has resulted in the "Inverted Food Pyramid" by Walter Willett. This pyramid also suggests reducing the amount of refined and high-glycemic index products, including bread, potatoes and maize, in the diet, and less dairy and red meat is suggested. This diet, preferably with 40% of energy from fat and more than >20 % of energy from mono-unsaturated fat (MUFA), is not regarded by these scientists to lead to weight gain. However, it is generally agreed that dietary recommendations should be based on large, long-term, randomised, dietary intervention studies, and such are currently being conducted.

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Obesity, socioeconomic status and food intake in children

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There is growing and substantial evidence linking socioeconomic status (SES) to the development of obesity not only in industrialised but in developing countries[1]. Children from lower SES families spend more time watching television[2], and consume diets high in fat and low in fruits and vegetables[3]. In Scotland, the prevalence of obesity is one of the highest in Europe, with corresponding increases in dyslipidaemia and insulin resistance among children creating a significant risk for type II diabetes and cardiovascular disease in later life[4]. We have conducted a study of 2454 school children aged 4 – 10 years as part of a BBSRC-funded energy balance project to identify genetic markers of obesity risk. Height and body weight data were collected on one occasion in the school environment between March 2002 and January 2003. Standing height, without shoes, was measured (to the nearest 0.1 cm) using a stadiometer. Body weight was measured (to the nearest 0.1 kg) using a mechanical scale with children wearing light clothing. Body mass index (BMI) for each child was calculated as weight/height^2 (kg/m^2). Individuals were assessed for overweight and obesity according to recent international data in which age and gender appropriate cut-offs are defined[5]. In addition, a smaller cohort (n = 100) enriched for 3 common variants of the *PPARG* gene: C–681G, Pro12Ala and C1431T were investigated in more detail with parental reports of food intake by 24hr recall coupled with food frequency questionnaires.

The socio-economic mix of pupils attending each school was assessed as the percentage of pupils entitled to free school meals (FME). This measure has no relationship with the actual ingestion of such food by the pupils, and therefore does not reflect the quality, or impact of the school meals. This data is routinely collated as a convenient socioeconomic indicator by local government in Scotland as an index of deprivation status. Schools fell into a bimodal distribution of low and high-income levels according to FME designation (lower-income group n= 1025), and higher-income group n= 1429).

Overweight or obesity prevalence was 24.6%, whilst prevalence of obesity alone was 6.1%. Girls were more likely to be overweight or obese than boys, as has been observed with other recent UK surveys. These results represent a marked increase from the previous survey conducted in Scotland in 1994, and these data confirm that the previously forecast epidemic is continuing to develop at an exponential rate. When we examined obesity levels in the higher and lower income groups, we found that the prevalence of obesity was much higher in the lower-income group when compared with the higher-income group. Girls were more likely to be overweight or obese than boys in both groups and the girls from the lower-income group have a very high prevalence of overweight or obesity of 31%. The lower income group was 65% more likely than the higher-income group to develop obesity.

Interestingly, although the prevalence of obesity was greater in the lower-income group, there was no weight difference across the income groups (age and sex adjusted). However, when we examined the age and sex adjusted height in the lower and higher income groups, we found that the lower-income group were, on average, 1.26 cm shorter, and this was consistent in both sexes ($p < 0.0001$). This represents a substantial height limitation, as it can be compared to a 1 cm difference in height between boys and girls at this age. This socio-economic difference in height was apparent throughout the ranges of BMI, with growth limitation evident even in overweight or obese children, although overall, overweight children were taller regardless of economic income group. The fact that overall growth is identical in the two groups, demonstrates that the increase in prevalence of obesity in the lower socio-economic group is largely due to the height-growth limitation, and not overall energy availability.

Examination of the diets of children from low and high-income groups demonstrated that intakes of starchy foods including pasta, rice, and high fibre breakfast cereals were higher in higher income boys and that consumption of sweets, chocolates and fizzy drinks was higher in lower income children of both sexes. Overall, children in lower income groups consumed diets which had fewer healthier choices which may contribute to the difference in overweight and obesity by socioeconomic status found in the larger cohort. However, differences in height limitation are likely to be connected to the *in utero* environment experienced by children from lower SES groups. Therefore, prevention of obesity and efforts to tackle the obesity epidemic should incorporate strategies during pregnancy as well as early infant development.

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Prevention of obesity: is it ever too late to start?

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With the increase in the prevalence of overweight and obesity in many societies and the realization of the impact this has on the burden of disease as well as on the economy there is a growing interest in effective obesity prevention programmes. Particular attention is usually devoted to programmes that are aimed at prevention of overweight in children. This attention is much deserved but if this implies that prevention programmes are limited to children and adolescents only this may be quite inappropriate. In the following section we will try to argue that cost-effectiveness is actually continuously improving with age up till quite high ages.

The reason why most people favour interventions in children is that behaviour in children may be changed more easily than in adults and that chronic disease have early origins and these disease processes may be more effectively altered at relatively young ages. On the other hand it may be argued that:

1. The sharpest increase in the incidence of obesity is in adulthood. For instance, based on cross-sectional analyses, the prevalence of obesity in The Netherlands increases from 4.4 percent in 20-29 year old men to 14.7 percent in 50-59 year old men. In women these percentages increases from 5.4 to 17.0 respectively. These are underestimates of the age-related increase in obesity because they are based on cross-sectional data and do not include secular increases in BMI.

2. Adults usually continue to gain weight during adulthood (particularly in young adulthood). Studies based on cross-sectional data usually underestimate weight gain with aging because the older people in such studies have a lower prevalence of obesity than the younger people because they are part of birth cohorts that have experienced periods in which obesity was less common. It is important to separate age and cohort effects such analyses and longitudinal data are necessary.

3. Adult weight gain is (independently of the degree of overweight) a risk factor for many diseases such as heart disease, type 2 diabetes mellitus and breast cancer and all-cause and coronary heart disease mortality.

4. Although for many diseases the relative risks for disease associated with obesity decrease with age, the absolute risk and population attributable risks for disease increase with age. The absolute risk is the age-specific incidence rate of diseases. The population attributable risk is calculated from the prevalence of obesity (which increases with age) and the relative risk. Clinical thinking is dominated by a focus on the relative risk (what does this factor do for the health of a particular patient) although this is increasingly combined with estimates of the absolute risk. In public health the focus is mainly on population attributable risks (what proportion of new cases in the population can be attributed to the risk factor). Some public health oriented studies, however, also focus on the relative risk. Gostynski *et al* (2004), for instance, reported recently that the risk (odds ratio) of hypercholesterolaemia for obese versus people with normal weight decreased with age from an odds ratio of 3.4 in men aged 25-29 years of age to an odds ratio of 1.7 in men aged 55-59 years of age. They suggested that obesity prevention was of particular importance in young adults because "the effects of obesity were strongest" in that age group. The prevalence of obesity, however, increased from 5 percent in the younger men to 18% in the older men. From this one can calculate that the population attributable risk is actually the same in both age-groups (11%). The prevalence of hypercholesterolaemia is also increasing with age from about 11% in the younger men to about 35% in the older men. This means that obesity is responsible for more cases of hypercholesterolaemia in the older men compared to the younger men. This illustrates that although the relative risk for disease may decrease with age, the contribution of obesity to ill health on a population level is actually increasing with age.

5. Prevention of weight gain and weight loss in adults have been shown to be related to dramatically reduced relative risks for, for instance, type 2 diabetes mellitus in high risk populations (see table). In the Finnish Diabetes Prevention Study a small weight gain (3%) was associated with a doubling of the risk of type 2 diabetes in high-risk individuals (obese and with impaired glucose tolerance). Weight gain prevention may be particularly of importance in those who are already overweight since the relationship between body mass index and risk of type 2 diabetes is increasing exponentially.

6. Interventions in children and adolescents need to be maintained for many more years or decades in order to have a considerable effect on the number of new cases of type 2 diabetes mellitus and heart disease or cancer compared to interventions in older people.

7. If interventions on weight gain prevention are directed to young adults and older by supporting healthier diets and physical activity it is likely that these will also affect others in the household. Health promotion aimed at schools is much less likely to affect the parents.

Most studies that have addressed the health impact of overweight or obesity in older people are based on studies that have used the body mass index as a measure of excess fat mass. It is increasingly clear that in older men and women it may be much more informative to study changes in waist circumference rather than changes in weight. "Waist gain prevention" may have important public health benefits even in people aged 70 and older. All these considerations make it quite likely that weight (or waist) gain prevention in adults at least up to the age of 65 or 70 years of age is likely to be more effective and more efficient compared to overweight prevention in children and adolescents over a given period of say 5 to 10 years. This does not mean we should not devote a lot attention and money to health promotion programs in children and adolescents but that we should not neglect the considerable health gains that we can be obtained by weight gain prevention in adults. Obesity prevention should be based on a life-course approach as currently recommended for noncommunicable diseases in general by the World Health Organization.

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Session 1 :
MEDITERRANEAN TYPE DIET / METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

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Observational studies of dietary factors and the metabolic or insulin resistance syndrome

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The metabolic or insulin resistance syndrome is a loose clustering of metabolic abnormalities which is associated with type 2 diabetes and cardiovascular disease. Different studies use alternative definitions of the syndrome as a whole or focus on individual components. Thus the literature is complex as there is little comparability between studies in the outcomes used. Reduction of the syndrome to a globally accepted standard binary state might reduce the diversity between studies, but may not be appropriate if aetiological factors differ in their pattern of association with the different components of the syndrome. This problem affects the study of nutritional factors and the metabolic syndrome as some nutrients appear to have different effects on lipids and glycaemic control, for example.

Observational studies of the association of specific macro or micronutrients, foods or dietary patterns with measures of insulin resistance have tended to be cross-sectional in nature. The intake of a diet with a high proportion of polyunsaturated fatty acids (PUFA) has been associated with greater insulin sensitivity independently of obesity and other confounding factors. The problems of residual and unmeasured confounding are, however, considerable. Such an association is supported by data of the biologically plausible effect of n3 PUFAs on insulin resistance.

Other nutrient factors reported to be associated with insulin resistance include dietary fibre, alcohol, vitamin c and the glycaemic index of the diet. Further aetiological studies of dietary factors and the metabolic syndrome are necessary.

Beyond the study of individual nutrients, specific food groups have been studied in relation to the insulin resistance syndrome or specific components of it, including diary products, fruit and vegetables, and fish. These studies not only provide clues for further aetiological investigation but can also be the focus for preventive action. Principal component analysis and other forms of factor analysis have been used to identify dietary components related to the metabolic syndrome. However, these analyses do not tend to produce conclusions that are easily translated into a public health message. The association of patterns of eating that are comprehensible to the lay public are more likely to provide data that could support public health intervention. The recent demonstration in the CARDIA study of an independent prospective association of fast food consumption with weight gain and worsening insulin sensitivity, would be one such example.

Overall the data relating dietary factors and the metabolic syndrome are limited and further observational studies of nutrients, specific foods and dietary patterns are required to support and inform randomised controlled trials.

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Diet and Type 2 diabetes from observational studies

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Excess adiposity is the most important risk factor for diabetes, and thus, maintaining a healthy body weight and avoidance of weight gain during adulthood is the cornerstone of diabetes prevention.(1) However, many dietary factors have been associated with risk of diabetes independent of obesity.(2) There is increasing evidence that specific types of fat consumed is more important than total amount of fat in risk of diabetes. Substituting unsaturated fat for saturated fat has been shown to increase insulin sensitivity in intervention studies. Higher intake of vegetable fat or polyunsaturated fat has been found to be inversely associated with diabetes risk in the Nurses' Health Study and the Iowa Women's Study, two large cohort studies among women. Thus, public health strategies should emphasize replacing saturated and trans fats with unsaturated fats. Similar to total fat, the total percentage of energy derived from carbohydrates in the diet has generally not been found to predict diabetes risk. Metabolic consequences of carbohydrate intake depend not only on their quantity but also on their quality. The overall glycemic index and load of a diet has been associated with an increased diabetes risk in several prospective observational studies. Effects of carbohydrate-rich foods on insulin resistance and diabetes risk also depend on fiber content and type. Fiber tends to slow down gastrointestinal absorption, resulting in a lower glycemic index of whole-grain products compared to their refined-grain counterparts, but other mechanisms by which whole grains influence glucose metabolism are likely to play a role as well, e.g. short-chain fatty acid production and micronutrient content such as magnesium. Several studies have found an inverse association between magnesium intake and risk of diabetes.

Iron is a transitional metal that can catalyze the conversion of poorly reactive free radicals into highly active free radicals, which may play a role in the development of diabetes. Iron excess seems to contribute initially to insulin resistance by decreasing glucose uptake by muscles and subsequently to decreased insulin synthesis and secretion in the pancreas. Increased total body iron stores reflected by a higher ferritin levels have been associated with an increased risk of type 2 diabetes.(3) Heme-iron intake from red meat has also been associated with increased risk of type 2 diabetes.

The relationship between consumption of specific foods or beverages and diabetes risk has received increased attention. An inverse association between coffee consumption and risk of type 2 diabetes has been consistently observed in several prospective cohort studies. The beneficial effect of coffee consumption on the development of diabetes has mainly been attributed to caffeine, but other constituents of coffee, e.g.potassium, niacin, magnesium, and antioxidant substances, may have beneficial effects on glucose metabolism and insulin resistance as well. Frequent consumption of meat, in particular processed meat, has been consistently shown to increase the risk of diabetes in prospective studies. Recent findings from prospective studies also indicate that consumption of nuts may have beneficial effects in the development of diabetes.(4) In addition, several epidemiologic studies found that diets rich in whole grains may protect against type 2 diabetes. Controlled feeding studies have found benefits of substituting of whole grains for refined grains on insulin sensitivity and glucose metabolism.

Sugar-sweetened beverages have received growing attention as potential contributors to the obesity and diabetes epidemic. Energy contained in beverages seems less well-detected by the body, and subsequent food intake is poorly adjusted to account for the energy intake from beverages. Sugar-sweetened beverages have been associated with weight gain and type 2 diabetes in a large cohort study of younger and middle-aged women.(5)

Moderate alcohol consumption (1-3 drinks/day) has been consistently associated with lower incidence of diabetes compared to abstinence. Most studies have observed a u-shaped association, with heavy alcohol consumption being associated with increased risk compared to moderate consumption.

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Dietary interventions and the metabolic syndrome

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Until recently, the valuation of the Mediterranean diet focused on the low content of saturated fatty acids and the high content of composite carbohydrates and dietary fiber. Recent studies imply that other compounds of the Mediterranean diet, the antioxidants, which exists in abundance in vegetables, fruit, beverages and also in virgin olive oil, may contribute to the prevention of coronary heart disease and possibly several forms of cancer and other diseases, thus providing a plausible explanation for its apparent benefits.

A shortage of antioxidants in the diet might promote CHD through mechanisms other than the accumulation of oxidized LDL in macrophages (1). The occurrence of CHD depends not only on the rate at which atherosclerotic plaque grow, but also on endothelial function, smooth muscle cell proliferation, thrombosis, and plaque rupture. For example, a single high-fat meal rich in saturated fat (Western meal) impairs endothelial functions in healthy subjects; this does not occur when the same subjects eat an isocaloric high-carbohydrate meal (pizza), as evidenced by the unchanged plasma levels of adhesion molecules ICAM-1 and VCAM-1, proinflammatory cytokines TNF-_ and interleukin-6, and the unchanged vascular response to L-arginine, the natural precursor of nitric oxide (2,3).

Because oxidative processes are important in the development of atherosclerosis, and in the light of epidemiological associations that provided support for the potential health benefits of foods rich in natural antioxidants, antioxidant-vitamin supplementation has been proposed for the treatment and prevention of coronary disease. Epidemiological associations do not indicate causality, however. The protective effects of vegetables and fruit are not observed with pharmacological doses of plant foods or their constituents. At present, there is little direct experimental evidence from randomized trials in setting of primary prevention. The encouraging controversial results of short-term trial in participants with coronary atherosclerosis were followed by two mega-trials with vitamin E in a postmyocardial infarction population, and in patients at high cardiovascular risk which failed to show clinical benefits. More recently, Miller and colleagues (4) report the results of a carefully conducted meta-analysis of clinical trials of vitamin E supplementation. They conclude that high doses of this agent increase the risk for death. Their meta-analysis involved data from 19 randomized trials, which recorded 12 504 deaths. Overall, being randomly assigned to receive vitamin E had no effect, either positive or negative. However, the data suggested a decreased risk for death associated with vitamin E in trials that used lower doses (≤400 IU) and showed a statistically significant trend toward increased risk at doses of 400 IU and above.

It is wrong to focus on a single element of the diet; this may explain, at least in part, the disappointing and frustrating results obtained in trials with vitamin supplementation, prematurely thought to be "the magic bullet" preventing a whole myriad of chronic diseases. Guidelines from some professional or governmental panels recommend attempting to obtain vitamins and minerals from food sources rather than from supplements.

Dr. Esposito from our group (5) explored possible mechanisms underlying a dietary intervention. The authors randomized 180 patients (99 men, 81 women) with metabolic syndrome to a Mediterranean-style diet (instructions about increasing daily consumption of whole grains, vegetables, fruits, nuts, and olive oil; n = 90) vs a cardiac-prudent diet with fat intake less than 30% (n = 90). Physical activity increased equally in both groups. After 2 years, body weight decreased more in the intervention group than in the control group, but even after controlling for weight loss, inflammatory markers and insulin resistance declined more in the intervention than in the control group, while endothelial function improved. Only 40 patients in the intervention group still had metabolic syndrome after 2 years compared with 78 patients on the control diet. These results suggest a plausible mechanism for the beneficial effects of the Mediterranean diet.

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He is a recipient of several prestigious scientific awards. Professor Tuomilehto sits on the Advisory Board of several international scientific journals.

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Dietary interventions and the risk of type 2 diabetes

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Several lifestyle factors are known to be associated with type 2 diabetes risk, but data on high-risk subjects who constitute the target of the potential preventive intervention are scarce. Nevertheless clinical trials and several cohort studies in various countries, and cultural and socioeconomic settings have evaluated the potential for dietary prevention of type 2 diabetes. There is convincing evidence for a decreased risk of diabetes in adults who are physically active, maintain a normal BMI throughout adulthood, and in overweight adults with impaired glucose tolerance who lose weight voluntarily. An increased risk for developing type 2 diabetes is associated with overweight and obesity; abdominal obesity and physical inactivity. It is probable that a high intake of saturated fats and intrauterine growth retardation also contribute to an increased risk, while non-starch polysaccharides, i.e. dietary fibre are likely to be associated with a decreased risk. From existing evidence it is also possible that omega-3 fatty acids, low glycaemic index foods and exclusive breastfeeding may play a protective role, and that total fat intake and trans fatty acids may contribute to the risk. However, insufficient evidence is currently available to provide convincing proof.

The Finnish Diabetes Prevention Study (DPS) comprises 522 over-weight, middle-aged men and women with impaired glucose tolerance (IGT) were randomised either to get 'usual care' (control) or intensive lifestyle counselling to reduce weight, to increase physical activity and intake of dietary fibre, and to decrease intake of dietary fat and saturated fat. Lifestyle goals were ≥5% weight reduction, moderate intensity physical activity ≥30 minutes/day, dietary fat <30 E%, saturated fat ≥10 E%, and fibre ≥15 g / 4.2 MJ. In the intention-to-treat analysis the lifestyle intervention in the DPS resulted in a 58% reduction in the risk of type 2 diabetes during a period of 3.2 years on average.

For the analysis of effects of diet on the risk of diabetes in the DPS the treatment groups were combined. Dietary intake by 3-day food records was measured at baseline and annually and mean intakes of fibre (g/1000 kcal), total fat (E%), and saturated fat (E%) during the intervention were calculated. Diabetes status was assessed by repeated 75-g oral glucose tolerance test at annual clinic visits. The Cox model was used to analyse the relationship between quartiles of fibre, fat and saturated fat intake and risk of getting diabetes during the mean follow-up of 3.9 years. Furthermore, to estimate the combined effect of fat and fibre intake, individuals were divided by median into four categories: low-fat/high-fibre, low-fat/low-fibre, high-fat/high-fibre, and high-fat/low-fibre. All models were adjuster for sex, treatment group, baseline weight, baseline 2-h plasma glucose, weight change and physical activity.

In separate models, fibre, fat, and saturated fat intake were all associated with diabetes risk. Hazard ratios (highest compared with lowest quartile) were 0.41 (95% CI 0.22-0.79) for fibre intake, 2.47 (95% CI 1.38-4.40) for fat intake, and 1.91 (95% CI 1.06- 3.46) for saturated fat intake. Compared with the low-fat/high-fibre category, hazard ratios were 1.95 (95% CI 0.94-4.06), 2.99 (95% CI 1.60-5.56), and 2.18 (95% CI 1.29-3.68) for low-fat/low-fibre, high-fat/high-fibre, and high-fat/low-fibre, respectively.

None of the subjects who achieved 4 or 5 of the lifestyle targets developed diabetes. Thus, various dietary components jointly with physical activity provided a strong protection against diabetes. The extended follow-up of 3-4 additional years after the intensive lifestyle intervention was discontinued showed that the effect of the intervention provided a long-term, sustained reduction of the diabetes risk.

In conclusion, dietary fat and fibre intake are significant predictors of progression to type 2 diabetes in high-risk subjects even after adjustment for weight, weight change and physical activity. Based on the strength of available evidence regarding diet and lifestyle in the prevention of type 2 type 2 diabetes, it is recommended that a normal weight status in the lower BMI range (BMI 21-23) and regular physical activity be maintained throughout adulthood; abdominal obesity be prevented; and saturated fat intake be less than 7% of the total energy intake.

SESSION 1 :
MEDITERRANEAN TYPE DIET / METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

CARDIOVASCULAR DISEASES (CVD)

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From 1994 to 1996, he was Head, of the Unit of Cardiovascular Research, Consorzio "Mario Negri Sud". Since 1997 to date, he has been Head of the Laboratory of Clinical Epidemiology of Cardiovascular Disease, Consorzio "Mario Negri Sud".
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Dr Marchioli is member of several scientific associations : Società Italiana Studio Emostasi e Trombosi (SISET), International Society of Haemostasis and Thrombosis (ISHT), Associazione Nazionale Medici Cardiologi Ospedalieri (ANMCO).

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Cardiovascular risk, n-3 PUFA, and dietary habits after myocardial infarction : «The GISSI - Prevention study»

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GISSI-Prevenzione was conceived as a population, pragmatic trial in patients with recent myocardial infarction and conducted in the framework of the Italian public health system. In GISSI-Prevenzione, long-term administration of n-3 PUFA (1 g daily) significantly decreased the risk of overall (-20%), cardiovascular (-30%), and sudden death (-45%). The administration of n-3 PUFA was associated with similar benefit in subgroups of patients stratified according to: a) various baseline characteristics; b) different dietary habits during follow-up.

Objective:To ascertain whether simple dietary advice to increase the consumption of Mediterranean foods, given in a clinical setting, leads to reduced mortality after a myocardial infarction.

Design: Data were used from the GISSI-Prevenzione clinical trial, analysed as a cohort study with adjustment for treatment allocation. Setting: A total of 172 centres in Italy.

Subjects:A total of 11 323 men and women with myocardial infarction. All subjects received advice to increase their consumption of fish, fruit, raw and cooked vegetables and olive oil.

Measurements: The intakes of the five foods were assessed at baseline, 6, 18 and 42 months. Associations of food intakes, a combined dietary score, and the risk of death over 6.5 y were estimated adjusting for several non-dietary variables, using pooled logistic regression.

Results: Subjects generally improved their diet according to the advice given. All foods were associated with a significant reduction in risk of death. Compared with people in the worst dietary score quarter, the odds ratio for those in the best score quarter was 0.51 (95% CI 0.44 – 0.59). A good diet had a protective effect in sub-groups defined by age, sex, smoking, randomized treatment and concomitant drug therapy.

Conclusions: Myocardial infarction patients can respond positively to simple dietary advice, and this can be expected to lead to a substantial reduction in the risk of early death. Regardless of any drug treatment prescribed, clinicians should routinely advise patients with myocardial infarction to increase their frequency of consumption of Mediterranean foods.

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She currently is programme director on a large project on Gene-diet interactions in the metabolic syndrome.

Dr Feskens is involved in several EU financed projects on obesity and nutrigenomics, and is member of the steering committee of EPIC-Heart and EPIC-Diabetes.

RECENT PUBLICATIONS

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Changing dietary patterns reduces CVD risk – Evidence from primary prevention trials

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During the last decade several observational studies have pointed out that, instead of individual nutrients, also dietary patterns or indices can be associated with mortality or disease risk. The reported inverse association between an Mediterranean Diet Index and mortality, such as observed in the EPIC cohorts from Greece (1), as well as our own Healthy Diet Index associated with reduced mortality in the Finnish, Dutch and Italian cohorts of the Seven Countries Study, or the HALE Study (2) are good examples of these type of studies. However, observational studies may be prone to (residual) confounding, and also causality is an issue. Therefore, evidence for the impact of a 'healthy' dietary pattern on CVD risk is preferably corroborated with findings from trials.

A well-known example is the Lyon Diet Heart Study, although this refers to secondary rather than primary prevention, as the subjects included had a history of myocardial infarction, and recurrence of MI was the primary endpoint. The findings from the Lyon Diet Heart Study illustrate the potential importance of a dietary pattern that emphasizes fruits, vegetables, breads and cereals, and fish, as well as the intake of a-linolenic acid. We have finished more recently a small-scale intervention study in high-risk subjects studying the impact of a Mediterranean diet advice and an ALA-enriched margarine on cardiovascular disease risk
factors in our Dutch population (3). The results showed that fish and vegetable consumption was improved and showed a tendency for improvements in risk factors.

A Mediterranean dietary pattern was also employed in a small-scale non-controlled intervention and showed some beneficial effects on for example total cholesterol, BMI and ox-LDL. Other interventions labelled their diet as Mediterranean but rather used an olive oil rich diet, but no documented changes in other foods (4). Other trials did not specifically address the Mediterranean dietary pattern but other 'healthy' ones, and focussed on CVD risk factors rather than the disease occurrence itself. The DASH trial, the Dietary Approaches to Stop Hypertension Trial, showed that had a reduced total and saturated fat and was rich in fruits, vegetable and low-fat diary foods substantially decreased blood pressure in the absence of weight change and at sodium intake approximating the typical US consumption. Subsequently, the PREMIER trial showed that the combination of the DASH diet, with weight loss, increased physical activity, reduced alcohol intake and sodium intake, reduced blood pressure even more.

Also several large-scale trials on the prevention of diabetes have been reported, showing that a combination of a healthy diet with increased physical activity and moderate weight loss reduce post-load glucose levels (5) and subsequent risk of diabetes, even more than medication (US Diabetes Prevention Program). Note that these studies included subjects with impared glucose tolerance, a high-risk group, thus providing no data on the cost-benefit of such interventions in the general population.

In summary, smaller-scale studies on cardiovascular risk factors have showed that combining individual recommendations of nutrients into a dietary pattern, preferably supported by other lifestyle changes, reduce risk factor levels. The major study on Mediterranean diet and coronary heart disease is (still) the Lyon Diet Heart Study, which is actually a secondary prevention study, with reinfarctions as primary endpoint. Thus, we can conclude that primary prevention trials are promising (e.g. DASH) but need to be expanded to other endpoints and other probably 'healthy' dietary patterns as well.

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RECENT PUBLICATIONS

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Mediterranean Diet and Cardiovascular Diseases : Beyond Cholesterol

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Cardiovascular risk may be influenced by various components of the diet. These act not only on the more classical risk factors - LDL cholesterol and blood pressure - but also on the so called " new " risk factors , such as other plasma lipids (triglycerides, small LDLs, HDL cholesterol), homocysteine, low-grade systemic inflammation, thrombotic tendency, oxidative stress, insulin sensitivity. Much attention has been paid particularly to dietary modulation of insulin sensitivity,considering that insulin-resistance/hyperinsulinemia may lead to atherosclerosis through different mechanisms. Therefore, the possibility to modulate insulin action could also translate into a beneficial effect on all the other related mechanisms with possible synergistic effects on cardiovascular risk.

Among the different dietary components, fat and carbohydrates still remain the most relevant, and certainly the most investigated ones. Intervention studies in which part of total or saturated fat was replaced by other nutrients – mainly monounsaturated or n-6 polyunsaturated fat– has shown a reduction of cardiovascular events that was especially evident in the studies lasting more than two years. Even n-3 fatty acids have been found consistently associated with a reduced cardiovascular mortality. Moreover its dietary supplementation in secondary prevention studies has induced a significant reduction of cardiovascular events, especially of sudden death. Each type of fat seems to influence cardiovascular risk through different mechanisms. Monounsaturated and n-6 polyunsaturated fat mainly improve metabolic risk factors profile, i.e. LDL cholesterol, blood pressure and also insulin-resistance. On the other hand, n-3 fatty acids, at least at the low/moderate dosage effective in reducing cardiovascular mortality, have no effect on the metabolic risk factor profile, including insulin-resistance. Therefore, it is likely that they act through other mechanisms, such as their antiarrhythmic effects.

With respect to carbohydrates, both a low glycemic load of the diet and a high dietary fiber intake, wether soluble or insoluble , have been found significantly associated with a reduced cardiovascular risk. Diets rich in fibers and/or with a low glycemic index surely reduce LDL cholesterol, but they also improve insulin-resistance and post-prandial blood glucose levels, another emerging, independent cardiovascular risk factor.

Very recently, more attention has been paid to the diet as a whole, more than to single nutrients or foods. A dietary pattern very similar to the traditional "Mediterranean diet" –characterized by a high intake of fruit, vegetables, legumes, whole grain cereals, monounsaturated fat, low-fat dairy products and a low intake of meat and high-fat diary products – has been found consistently associated with a very low cardiovascular risk. The very relevant heart-healthy benefits of this kind of diet most likely come from the diet as a whole, not from specific components. In fact, it is very likely that the ideal combination of the different dietary components produces a maximum effect on all or, at least, most of the factors involved in the development of the atherosclerotic process, such as plasma lipids, blood pressure, insulin-resistance,thrombotic tendency, inflammation, oxidative stress.

In conclusion, the potential of a Mediterranean style diet in reducing cardiovascular risk is quite established. Unfortunately, in most Mediterranean countries dietary habits are going in the wrong direction.

risk. Diets rich in fibers and/or with a low glycemic index surely reduce LDL cholesterol, but they also improve insulin

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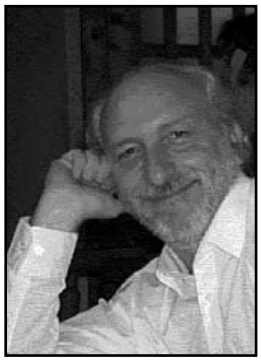

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Dr Panico is board certified in Medicine (Naples, 1975), in Nephrology (Naples, 1978), Master of Science Epidemiology University of London (1980) and in Cardiology (Naples, 1983).

He was director of the National Research Council Unit "CVD in Mediterranean women" between 1990-96.

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RECENT PUBLICATIONS

> Lahmann PH, **Panico S**,.., Riboli E. Body size and breast cancer risk: findings from the European ProspectiveInvestigation into Cancer and Nutrition (EPIC). Int J Cancer 2004;111(5):762-71.
> Iannuzzi A,..., Romano ML, **Panico S**, Rubba P, Trevisan M. Increased carotid intima-media thickness and stiffness in obese children. Diabetes Care 2004;27(10):2506-8.
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Cardiovascular disease preventable fraction in the population through adherence to Mediterranean diet

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The relationship between dietary patterns and cardiovascular disease has been evidenced during the last 50 years.

The strength of nutritional etiology of CVD relies both on the intermediate effect of risk factor (e.g., serum cholesterol, blood pressure, obesity) and a possible direct effect on atherosclerotic process (e.g., antioxidation, inflammation). The importance of the etiological issue should not obscure the issue of estimating the potential of the dietary modification towards healthier dietary patterns, which are relevant for public health.

The estimation of this potential varies according to: a) the type of the evaluated pattern (e.g., reduction in dietary fats, increase in antioxidants from food, etc.); b) the type of study design; c) the analytical methodology applied.

This paper revise the evidence of this potential, evaluating the estimates, with special respect to the new emerging data from the EPIC study and the Mediterranean pattern.

The impact on cardiovascular morbidity and mortality (which is also an indicator of longevity) has to be known both for supporting the investments on dietary prevention and to promote successfully lifestyle modifications in populations.

SESSION 1 :
MEDITERRANEAN TYPE DIET / METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

CARDIOVASCULAR DISEASES (CVD)

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He was Head of the Hypertension Section, Dept Medicine I, Gothenburg between 1970 and 1987 and Vice Dean of the Faculty of Medicine, Univ of Lund, between 1993 and 1999.

Doctor Berglund is member of the Swedish Medical Association, Swedish Heart Lung Foundation, Council on Epidemiology and Prevention, International Society of Hypertension, International Society of Angiology.

He has been implicated in several international missions: Participation in WHO-conferences in Kungälv (1971), Geneva (1972) and Sydney (1976) and work for WHO in Geneva and at the Copenhagen office.

Doctor Berglund is member of the editorial board of Journal of Internal Medicine, Hypertension, Journal of Human Hypertension. Member of the Steering Committee of EPIC.

RECENT PUBLICATIONS

> Nilsson PM, Nilsson J-Å, **Berglund G**. Family burden of cardiovascular mortality: risk implications for offspring in a national register linkage study based upon the Malmö Preventive Project. J Intern Med 2004;255:229-35.
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Diet visavi other CVD risk factors

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The classical risk factors for cardiovascular disease (CVD) are age, male sex, smoking, blood pressure, various lipid variables, obesity, diabetes, low physical activity, low social class and markers of inflammation. The impact of dietary factors has been less clear although is has been recognized that some of the established risk factors might be mediated through diet.

The Seven Country Study (1), an ecologic comparison in the 1960-ies of dietary factors, established CVD risk factors and risk of death from heart disease in men, seemed to indicate that 72% of the variation in CHD death between centers, was explained by the ratio of mono/saturated fat intake. When age, blood pressure, s-cholesterol, BMI and smoking was added, these variables could explain 96% of the variation in risk. CHD death rates increased with intake of saturated fat and decreased with increased intake of monounsaturated fat. Death rates were low in cohorts with high olive oil intake. The countries were, however, also characterized by high intakes of fruit and vegetables and fiber.

These ecological findings have not been possible to duplicate in prospective cohort studies. The Framingham study (2) could not detect a significant relationship between dietary factors (e.g. percentage of calories from various fat fractions) and risk of CVD. Other observational or intervention studies in the 1970-ies and 1980-ies gave diverging results. Two large observational studies in the US, the Health Professional Follow-up Study (HPFS) (3) and the Nurses Health Study (NHS) (4) do not add much clarity. A 5% increase in saturated fat with equivalent intake energy intake from carbohydrates, was not associated with a significantly increased risk of coronary heart disease (4). However, high intake of transunsaturated and polyunsaturated fats were associated with increased risk. Intake of monounsaturated fat had a borderline association with CHD risk. Thus, the CHD risk depended on quiality rather than quantity of dietary fat.

Recently the Interheart Study (5) – a case/control study of 15.152 patients with acute myocardial infaction and 14.632 controls – presented results allowing interpretation of the relative importance of various risk factors for cardiovascular disease. Regular consumption of fruit and vegetables was associated with a 30% relative risk reduction. Life style modifications such a increased fruit and vegetable consumption, moderate physical activity and smoking avoidance was associated with an 80% lower risk for myocardioal infarction, and should be the cornerstone of coronary heart disease prevention.

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Currently doing specialist training in cardiology at the University Hospital in Malmö, Sweden, as well as conducting PhD studies at Lund University, Department of Medicine, studying myocardial dysfunction in subjects with impaired glucose metabolism.

Main research interests: Primary and secondary prevention of cardiovascular disease; cardiovascular disease presentation in individuals with diabetes mellitus.

RECENT PUBLICATIONS

> **Leosdottir M**, Nilsson P, Nilsson J-Å, Månsson H, Berglund G. Cardiovascular event risk in relation to dietary fat intake in middle-aged individuals - data from The Malmö Diet and Cancer Study. J Intern Med. 2005; Submitted for publication.
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Energy and fat intake and CVD risk

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Over the last two decades evidence from large-scale epidemiological studies has been emerging, partly defying the previously believed hypothesis that dietary fat, especially saturated fat, increases the risk for cardiovascular disease [1,2]. In spite of conflicting evidence, most institutions and governmental authorities issuing dietary guidelines still encourage limiting the percentage of calories from total fat in the diet, usually to less than 30%, with special focus on limiting saturated and *trans* fatty acids.

The Malmö Diet and Cancer Study (MDC), one of the EPIC (European Prospective Investigation into Cancer) cohorts, is a population-based, prospective cohort study designed in the early nineties to identify dietary risk factors in relation to cancer 3. Birth cohorts of middle-aged men and women living at the time in Malmö, the third largest city in Sweden, were invited to participate. A questionnaire addressing various lifestyle factors and medical history was administered, a medical examination was conducted, and blood samples were drawn. Diet composition was evaluated with a questionnaire and a menu-diary. The recruitment stopped in 1996, when 28,098 individuals had participated in the study.

In a recent analysis from the MDC material, we examined whether total fat intake, saturated-, monounsaturated-, or polyunsaturated fat intake, were independent risk factors for prospective cardiovascular events (fatal and non-fatal). Adjustments were made for confounding by age, smoking habits, alcohol consumption, socio-economic status, marital status, physical activity, body mass index, fibre intake, and blood pressure.

In total, 1739 cardiovascular events were registered till the end of year 2002, during a mean follow-up period of 8.2 years. Individuals in the first quartiles of relative fat intake received on average 30.8% (women) and 31.7% (men) of their total caloric intake from fat. Respective percentages in the fourth quartiles were 46.1% (women) and 47.7% (men). No significant difference in relative risk between the four quartiles of relative fat intake was observed, for men or women. Nor was any significant difference in relative risk observed between the different quartiles of saturated fat intake, where individuals in the first and fourth quartiles received on average 12% and 22% of their daily caloric intake from saturated fat, respectively (approximately the same for women and men). No protective effects of relatively high intakes of mono- or polyunsaturated fats were observed. Note though, that *trans* fatty acids were included in the unsaturated fat variables in the MDC study, which could have confounded the results considerably.

Most researchers today agree on total fat intake not being a risk factor for cardiovascular disease [1,2,4]. Our results support this consensus. The largest bulk of evidence still pointing towards dietary fats influencing cardiovascular disease development, involves a high intake of industrially produced trans fatty acids, as well as lower risks with a high unsaturated/saturated fat ratio [2,4]. Monounsaturated fats seem to provide little if any protective effects in North-West European and American cohorts, but the main dietary source of monounsaturated fats in these regions is animal products and partially hydrogenated oils 4. The Mediterranean diet, in which the percentage of daily calories coming from fat is approximately 36%, has been shown to have a strong protective effect against cardiovascular disease. The main source of fat in the diet is monounsaturated fat from olive oil, with low contents of saturated fats. The diet is also rich with fruits, grains and vegetables – foods that have been shown to protect against cardiovascular disease 5. The non-Mediterranean high-fat western diets are on the other hand poor in fibre, fruits, and vegetables The important effect fibre intake on the fat-cardiovascular disease relationship was underlined in a recent study, with relative risks for the upper quintiles of total and saturated fat intake dropping by approximately 20% when additional adjustments were made for fibre intake [1]. Adjustments for fibre intake were generally not made in any of the studies on which most currently used dietary guidelines are based. These observations strengthen the hypothesis that it is fat quality, rather than fat quantity, as well as the other dietary factors that characterize high-fat western diets that matter when it comes to cardiovascular event risk.

Internationally used dietary guidelines recommending low fat diets have had great impact on both the lives of ordinary healthy free-living people and the food industry as a whole. While total energy intake over the last decades has increased to some extent, the percentage of total daily energy coming from fat has decreased, with intake of carbohydrates, mostly from refined sugars, increasing. Life expectancy has increased steadily during the same time, with incidence and death rates from cardiovascular disease diminishing dramatically. The changing nutritional- and life-style habits have, however, bred new problems with an overwhelming rises in the incidence of obesity and diabetes. In light of these changing trends, recent dietary and lifestyle advice from health authorities and professionals have increasingly stressed a balanced energy intake and regular physical activity to avoid obesity, and to eat a diet rich in fruits, vegetables and fibre, including calories from all energy sources.

Our results support this trend, and not the change towards low fat diets.

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Pr. Saracci has an MD and a PhD in medical statistics.

His early clinical research years were in clinical trials and methodological evaluation of laboratory tests. Subsequently he developed research on the environmental epidemiology of cancer for more than 25 years at the International Agency for Research on Cancer.

He is currently responsible for the expansion of cancer studies to cardiovascular diseases and is the principal investigator of the EPIC-Heart project, a prospective cohort study (500,000 subjects) of myocardial infarction in 10 European countries.

Pr. Saracci is also actively involved in methodological issues, in particular methods for improving exposure assessment in epidemiology, and in interactions between aetiological agents, as well as in ethical issues in epidemiology.

RECENT PUBLICATIONS

> Slimani N,..., **Saracci R**, Riboli E. European Prospective Investigation into Cancer and nutrition (EPIC) calibration study: rationale, design and population characteristics. Public Health Nutr 2002, 5:1125-45.
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Investigating cardiovascular diseases within the European Prospective Investigation into Cancer and Nutrition : the EPIC-Heart Collaboration

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The European Prospective Investigation into Cancer and Nutrition (EPIC) is worldwide the largest prospective cohort investigation of cancer aetiology with available information collected at baseline on more than half a million subjects on demographic, nutritional, anthropometric, lifestyle, occupational , residential variables as well as biological samples (plasma, serum, buffy coat, red cell membranes) collected at baseline for long term storage in liquid nitrogen on close to four hundred thousand subjects. Subjects have been recruited at twenty one centres in ten countries (Denmark, France, Greece, Germany, Italy, The Netherlands, Norway, Spain, Sweden, United Kingdom) and have been followed-up for about six years recording all new cases of cancer.

As deaths and their causes are also recorded the EPIC set-up allows to investigate other diseases as well. The EPIC-Heart Collaboration addresses cardiovascular diseases and as an initial exercise a number of statistical analyses are currently being carried out on fatal Ischaemic Heart Disease (IHD) . The relation is being explored between IHD (1544 fatal cases, 1119 males and 425 females) and anthropometric indexes, blood pressure, consumption of meat and processed meat , fish, fruits and vegetables, diary products , nuts, alcohol and use of tobacco products. Results from some of these analyses will be presented demonstrating the potential of the EPIC-Heart Collaboration to contribute useful information on the role of nutritional factors on IHD in today's European context. Planned developments include assembling of non-fatal IHD cases from those participating centres in which IHD incidence population data are available and laboratory studies to investigate novel risk factors for IHD using the nested case-control approach within the EPIC-Heart cohort.

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2003 : DrPH degree at the Technical University Berlin, Germany.

2002-2004 : Postdoctoral fellow in the Department of Nutrition at the Harvard School of Public Health.

Main research interests : Dietary pattern analysis; Nutrition, Obesity, Metabolic Syndrome, and its complications (Type 2 diabetes mellitus and CVD).

RECENT PUBLICATIONS

> **Schulze MB**, Hoffmann K, Kroke A, Boeing H. An approach to construct simplified measures of dietary patterns from exploratory factor analysis. Br J Nutr 2003;89:409-19.
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Dietary patterns and risk of CVD

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Cardiovascular disease (CVD) and stroke are the leading causes of death in industrialized countries. Risk factors for these diseases, among them diet, have long been a focus of epidemiologic research. With regard to diet, however, the dominant approach, that of examining single nutrients or foods, is fraught with problems due to the complexity of dietary intake in relation to diseases. The high degree of intercorrelation among nutrients, as well as among foods, makes it difficult to attribute effects to single dietary components. The single-nutrient approach might not adequately account for complicated interactions and cumulative effects, because people do not eat isolated nutrients; they eat foods and in particular patterns. In addition, in terms of public health, dietary patterns are more realistic representations of dietary intake in real life.

Recently, several studies have investigated the role of overall dietary patterns on risk factors for CVD. A pattern, characterized by high intakes of red and processed meats, sweets, and desserts, potatoes, French fries, and refined grains, appeared to be positively associated with biochemical markers of CHD while a pattern rich in fruits and vegetables, legumes, whole grains, poultry, and fish was negatively associated. In a recent trial over a 2-year period among men and women with the metabolic syndrome, a Mediterranean style diet characterized by increased consumption of fruits, vegetables, walnuts, whole grains, and olive oil significantly reduced concentrations of inflammatory cytokines, as well as improved endothelial function, insulin sensitivity, blood pressure, and blood lipids compared to the control group which consumed an otherwise healthy diet (<30% fat, <10% saturated fat) [1].

Prospective studies on US based dietary patterns and risk of CVD revealed that a dietary pattern high in fruits and vegetables, legumes, whole grains, poultry, and fish is associated with a decreased CVD risk. In contrast, a diet rich in red and processed meats, sweets, and desserts, potatoes, French fries, and refined grains appears to be associated with an increased CVD risk. Similarly, a Mediterranean diet was found to be associated with lower all-cause and cardiovascular mortality in a prospective cohort among Greek men and women [2]. Most recently, attempts have been made to define dietary patterns using biomarker information on CVD risk factors. Hoffmann et al. [3] identified a dietary pattern strongly associated with lower HDL cholesterol and higher C-peptide and CRP levels. The dietary pattern was characterized by high intakes of meat, margarine, poultry, and sauce and low intakes of vegetarian dishes, wine, vegetables, and whole-grain cereals and was strongly associated with a higher risk of MI.

Only two randomized trials have examined the effect of dietary patterns on CVD risk, both conducted among patients with existing myocardial infarction. In both studies, a Mediterranean-type diet rich in alpha-linolenic acid reduced the rate of cardiac events [4, 5].

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SESSION 1 :
MEDITERRANEAN TYPE DIET / METABOLIC SYNDROME AND CHRONIC DISEASE PREVENTION

CANCER

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Dr Riboli has an M.D. degree (1977, Milan), a Master of Public Health (1980, Milan) and a Master of Science in Epidemiology (1982, Harvard, Boston, USA).

In 1983 he moved to IARC-WHO in Lyon, where he undertook the task of developing new research projects in the area of nutrition, nutritional status and cancer. In 1989 he initiated the European Prospective Investigation into Cancer and Nutrition (EPIC), which eventually included 26 centres in 10 European countries. Questionnaire date on diet and lifestyle have been obtained from about 500,000 study subjects, and blood samples from most of them.

He is now Head of the Nutrition and Hormones Group of IARC, whose main object will be follow-up of EPIC over the next decade and research into the role of nutrition, lifestyle, environment, genetics and metabolic and hormonal factors in cancer etiology.

RECENT PUBLICATIONS

> Jenab M, Ferrari P, Slimani N, Norat T, … , **Riboli E**. Association of nut and seed intake with colorectal cancer risk in the European prospective investigation into cancer and nutrition. Cancer Epidemiol Biomarkers Prev 2004 ;13(10):1595-603.
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Where do we stand in the search for the nutritional causes of cancer ?

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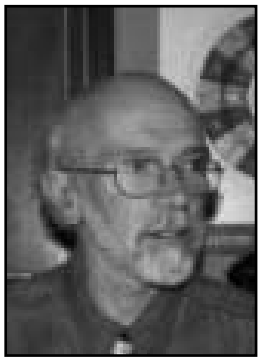

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Dr Berrino is involved in the following research programmes: ORDET Study (Hormones and Diet in the Etiology of Tumors): Cohort study with biological bank of ten thousand women to study hormones, diet and breast cancer; EUROCARE: European cancer, registries based study of cancer patients' survival and care (P L); EPIC Study (European Prospective Investigation into Cancer and Nutrition), Italian section: On going prospective study with biological bank of 50.000 subjets in Varese, Torino, Firenze and Ragusa. (National Coordinator); DIANA Project: Randomized trials on the effect of dietary changes on serum levels of endogenous hormones; COS project: European Case-Only Study on gene-environment interaction in breast cancer in young women.

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Nutrition, steroid hormones and breast cancer

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Prospective cohort studies have proven beyond reasonable doubt that plasma levels of total and bio-available endogenous sex hormones (androgens and estrogens) and insulin like growth factor (IGF-I) are major determinants of the subsequent occurrence of breast cancer. These factors cooperate in stimulating breast epithelial cell proliferation and preventing apoptosis. Their blood levels may depend on both genetic and environmental determinants. However, several studies of the genes responsible for sex hormone synthesis and metabolism, as well as those involved in the growth hormone/IGF/insulin pathways, failed to show any major role of the polymorphisms of the these genes in determining plasma levels of the relevant hormones and growth factors. On the other hand a few environmental determinants of these factors are well established: postmenopausal overweight, for instance, is associated with higher plasma levels of estrogens, and dietary proteins – especially milk proteins – are associated with higher plasma levels of IGF-I. Several studies suggested that components of the metabolic syndrome (low HDL, high blood glucose and triglycerides, high blood pressure and large waist circumference), which is linked to western diet and western life-style, are associated with breast cancer risk. Such relationship is likely to be mediated by the effect of diet and sedentary life-style on hormone and growth factor levels. Western diet and sedentary life-style, in fact, may favour insulin resistance and insulin may increase the availability of both sex hormones (through its gonadotropic effect and the inhibition of the liver synthesis of SHBG) and IGF-I (favouring the expression of growth hormone receptors and inhibiting of the liver synthesis of two IGF-binding proteins, the IGFBP1 and IGFBP2).

We carried out three clinical trials to test whether the hormonal pattern associated with breast cancer risk can be favourably modified through an insulin lowering diet, based on food with low glycaemic index and low saturated fat content (the DIANA – diet and androgens –trials):

DIANA-I, a randomized controlled study on 104 healthy but hyperandrogenic postmenopausal women proved that 4.5 months of a diet based on traditional Mediterranean and macrobiotic recipes are sufficient to significantly decrease total and free testosterone, free estradiol, insulin curve after OGTT, and increase SHBG, IGFBP1 and IGFBP2. Blood glucose, triglicerides, and total cholesterol also significantly decreased. Women were not recommended to decrease their calorie intake but as the diet was highly satiating they also loosed weight; most metabolic changes may have been at least partly mediated by weight change.

DIANA-2, a before-after trial on 110 recurrence-free breast cancer patients, confirmed the same metabolic effects and suggested that those women who succeeded to decrease their testosterone level also decreased the incidence of local recurrences, metastases and contralateral breast cancer.

DIANA-3, an ongoing randomised trial on 90 healthy pre-menopausal women, will test the effect on blood levels of sex hormones and of several growth factors of two insulin lowering diets, respectively with high and low protein content.

Together with other observational and experimental evidence, these studies indicate that diet may be a major determinant of breast cancer incidence and recurrences.

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1998-now : Research in Epidemiology in the Nutrition Unit, IARC, Lyon, France.

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Diet, obesity, physical activity and colorectal cancer

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Colorectal cancer is the third most common incident cancer worldwide. Large international variation in colorectal cancer incidence and mortality rates, and the prominent increases in the incidence of colorectal cancer in groups that migrated from low- to high-incidence areas provided important evidence that lifestyle factors influence the development of this malignancy. Moreover, there is convincing evidence from epidemiological and experimental studies that dietary intake is an important etiological factor in colorectal neoplasia. An overall evaluation of the scientific evidence published in 1997 concluded that the most effective ways of preventing colorectal cancer were consumption of diets high in vegetables, regular physical activity and maintenance of body weight, low consumption of red meat and consumption of diets high in non-starch polysaccharides, starch and carotenoids and low in sugar, fat and eggs (1).

More recent findings are emerging from new large cohort studies and pooled analyses, which might shift the preponderance of the evidence, as may be occurring with the dietary fiber–colorectal cancer association. In the European Prospective Investigation into Cancer and Nutrition (EPIC) - a study of over 500,000 people in 10 European countries- it was found that an approximate doubling of total fiber intake from foods could reduce the risk of colon cancer by 40% in populations with low average intake of dietary fiber (2).An international working group recently published a comprehensive evaluation of the available literature on fruit and vegetable intake and cancer. The group considered that there is limited evidence for a cancer-preventive effect of consumption of fruit and vegetables for colorectal cancer. Likewise, a higher intake of vegetables probably lowers the risk (3).

Recent results of prospective studies support a protective effect of calcium and vitamin D in the etiology of colorectal neoplasia. Studies in animals have suggested that calcium may reduce the risk of colorectal cancer. Some clinical trials have shown that consumption of calcium and dairy foods may reduce colonic epithelial cell proliferation. In a pooled analysis of primary data from 10 prospective studies in five countries, higher consumption of milk and calcium was associated with lower risk of colorectal cancer (4).

Several prospective studies have consistently reported that diets high in red and processed meat increase risk. Cooked meats contain heterocyclic amines, which are known colorectal carcinogens. Controlled human intervention studies have shown that endogenous nitrosation arising from ingestion of haem iron, but not inorganic iron or protein, may account for the increased risk associated with red and processed meat consumption. Fish intake has been found to be inversely associated with colorectal cancer risk in the EPIC study and some, but not all, prospective studies (5). These findings are in agreement with results from animal and in vitro studies indicating that n-3 fatty acids, especially the long chain polyunsaturated fatty acids eicosapentaenoic and docosahexanoeic acids, present in fatty cold-water fish and fish oils, inhibit carcinogenesis.

Physical inactivity and excessive adiposity, especially if centrally distributed, are consistent risk factors for colon cancer (6). Many biological mechanisms have been proposed whereby physical activity reduces the risk of colon cancer, including maintaining energy balance, enhancing the immune system, enhancing movement of the colon contents through the gut, regulating insulin levels, and altering prostaglandin levels. Obesity has been consistently associated with higher risk of colorectal cancer in men and women in both case-control and cohort studies. Similar relationships are seen for colon adenomas, with stronger associations for larger adenomas. The gender difference, in which stronger associations are seen in men than women, has been observed consistently across studies and population.

It has been estimated recently that about 70% of colorectal cancer could be avoided by changes in lifestyle in Western countries (7). Many of the diet and lifestyle risk factors for colorectal cancers are the same for cardiovascular disease and for some other cancers, so focusing on the modifiable risk factors for colorectal cancer is likely to have many additional benefits beyond this cancer.

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Professor Timothy Key studied veterinary medicine, nutrition and epidemiology.

His main interests are the roles of diet and hormones in the aetiology of cancer, particularly cancers of the breast, prostate and colon.

He currently works mostly on the European Prospective Investigation into Cancer and Nutrition (EPIC), as the principal investigator of the Oxford cohort of 60,000 subjects and the chairman of the EPIC prostate cancer group.

He also co-ordinates the Endogenous Hormones and Breast Cancer Collaborative Group, which conducts pooled analyses of the world-wide data on endogenous hormones and breast cancer risk.

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Vegetarianism and cancer risk

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Characteristics of vegetarian diets

Vegetarian diets are by definition devoid of meat and fish, and sometimes also exclude dairy products and eggs. Instead of meat and fish, vegetarians consume more cereals, pulses and nuts, and usually consume more fruits and vegetables than meat-eaters. In terms of nutrients, vegetarian diets are usually relatively high in carbohydrates, fibre, carotenoids, vitamin C and potassium, and relatively low in protein, fat (especially saturated fat and long-chain n-3 fatty acids) and vitamin B12. Vegetarians are usually thinner and have lower blood cholesterol than meat-eaters. Hormones can affect cancer risk; no clear differences have been established in sex hormone levels between vegetarians and non-vegetarians, but vegans have been shown to have lower blood levels of insulin-like growth factor-I than either lacto-ovo-vegetarians or meat-eaters.

Studies of vegetarian diets and cancer

There are only a few epidemiological studies which have investigated cancer risk in vegetarians; three prospective studies among vegetarians and comparable non-vegetarians in Britain, two prospective studies among Seventh day Adventists in California, a small prospective study in Germany, and a case-control study of breast cancer among women of south Asian origin in Britain.

Colorectal cancer

It has been proposed that vegetarian diets might reduce the risk for colorectal cancer because they are devoid of meat and also usually comparatively rich in putative protective foods and nutrients such as cereals, fruits, vegetables and dietary fibre. Both the prospective studies which have examined the association of vegetarian diets with the incidence of colorectal cancer have observed a lower incidence among vegetarians than among meat-eaters, but the pooled data from these and other studies have not suggested a lower mortality from colorectal cancer among vegetarians than among meat-eaters.

Breast cancer

Pooled analysis of the five prospective studies in western vegetarians has shown that mortality rates from breast cancer are similar in vegetarians and non-vegetarians; incidence rates were not examined in these studies, but the similar mortality rates suggest that there is unlikely to be much difference in incidence. The case-control study in British Asians showed that breast cancer risk was slightly but not significantly lower in lifelong vegetarians than in meat-eaters.

Other cancers

There are few if any data on the incidence of other cancers among vegetarians, but the pooled analysis of prospective studies showed that mortality rates for stomach cancer, lung cancer and prostate cancer were similar in western vegetarians and non-vegetarians.

Conclusions

Few studies have investigated cancer rates in vegetarians. The data available suggest that colorectal cancer rates might be a little lower in vegetarians than in meat-eaters, but no difference has been observed for mortality from colorectal cancer, therefore no strong conclusions can be drawn. The data on breast cancer, stomach cancer, lung cancer and prostate cancer do not suggest large differences in rates between vegetarians and non-vegetarians. More research is needed to establish whether vegetarian diets may reduce the risk for colorectal or other types of cancer, to examine cancer rates in non-western vegetarians, and to investigate cancer rates in vegans.

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Dr Domenico Palli is Chief of the Molecular and Nutritional Epidemiology Unit, Cancer Research and Prevention Center , Scientific Institute of Tuscany, Florence, Italy.

He is a principal or co-investigator, in several projects in the field of nutrition and molecular epidemiology, including the evaluation of population-based cancer screening programmes, a multi-center study on 'Diet and gastric cancer' funded by the National Cancer Institute (Bethesda-USA), and the European multi-center study EUROGAST.

Since 1992, he co-ordinates locally, and is a member of the central steering committee, of the EPIC study (European Prospective Investigation on nutrition and Cancer - International Agency for Research on Cancer, and funded by theEuropean Union and by the Italian Association for Cancer Research).

From 1995, he collaborated to the project 'The Food Composition Database for Epidemiological Studies in Italy', that has been of key importance for the analysis of the EPIC study. He is involved in several nutritional and molecular epidemiology projects, among which 'Diet, lifestyle and geno-toxicdamage (endogenous DNA adducts from lipid peroxidation)' and the European 6FP project "DiOGenes" on obesity.

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Mediterranean diet and cancer

Domenico Palli, Molecular and Nutritional Epidemiology Unit, Cancer Research and Prevention Centre (CSPO) Scientific Institute of Tuscany, Italy.

After Ancel Keys reported a lower mortality in the Mediterranean area in relation to dietary habits, the term "Mediterranean Diet" has been widely used. Nutritional epidemiologists have looked for the relation between dietary habits and cancer, investigating foods or food habits that have been hypothesised to be protective or harmful. Although a role of diet is often not as evident for cancer as it is for cardiovascular disease, many factors definitely play a role in specific types of cancer, suggesting that Mediterranean dietary habits are relevant also in the field of cancer prevention.

The most recent literature has focused on single food items or food groups, nutrients and food patterns, overall suggesting a protective effect of Mediterranean dietary habits. Attempts have also been made to summarise the Mediterranean Diet with a summary index or score. In the past analyses were mostly based on case-control studies, but more recently results from large prospective studies have become available, both for US populations and in Europe.

It is well known to nutrition epidemiologists that methodological issues are often linked to differences in reported findings. Several case-control studies in Mediterranean countries (Italy, Greece, and Spain) have evidenced in the last decades a protection from various types of cancer (respiratory and digestive tract, prostate, breast) with a higher intake of antioxidants (among which vitamin C, carotenoids, flavonoids and olive oil phenols) and consumption of fruits and vegetables, fish, whole grain, etc.

Prospective studies focusing on the same "components" have evidenced a protection only in relation to some but not all types of cancer. In particular, fruit was shown to be protective for lung cancer, and fibre was protective for colorectal cancer in the EPIC study (European Prospective Investigation into Cancer and nutrition). Tomatoes, the main source of lycopene in human diets, and so characteristic of the Mediterranean dietary habits, have been related to a reduced incidence of prostate cancer, both in prospective and in retrospective studies, but not within EPIC. A special attention must be given to wine, often present on Mediterranean tables. Despite red wine's content in polyphenols, the risk of most types of cancer appears to be increased when its consumption is high, in both case-control and prospective studies.

In addition to studies related to specific components or nutrient, researchers have recently focused on diet as a whole. Adherence to the traditional Mediterranean diet was assessed by a 10-point Mediterranean-diet scale that incorporated the salient characteristics of this diet in the Greek component of the EPIC study.
A reduction of cancer deaths was associated with a higher Mediterranean diet score, with an adjusted hazard ratio 0.76 (95 percent confidence interval, 0.59 to 0.98). In general, no specific food group was linked to a protection. Also a multicentre longitudinal study on subjects aged between 70 and 90 years (The Healthy Ageing: a Longitudinal Study in Europe - HALE) observed that adhering to a Mediterranean diet resulted in a protection for from cancer.

Implementing an intervention trial of dietary change with cancer as the main outcome is not an easy task, for various reasons, including the need to identify strong intermediate endpoints to be investigated as indicators of increased risk. Recently, researchers have attempted to implement such intervention studies. The oldest one is probably the Lyon Heart Study, that compared overall survival and newly diagnosed cancer rates among 605 patients with coronary heart disease randomised to follow either a cardio-protective Mediterranean-type diet or a control diet similar to the step 1 American Heart Association prudent diet. Results are suggestive of a possible protection from overall cancer mortality. Another recent trial conducted in Chile concentrated on markers of cardiovascular disease (plasma fatty acids), showing increased concentration of monounsaturated fatty acids in the group assigned to the Mediterranean intervention.
An intervention study, still ongoing in Sicily (Italy), aims at observing changes in serum and urine hormone levels as early predictors of breast cancer risk: women in the intervention group attended a weekly "cooking course" for 1 year based on the correct use of the natural ingredients of the traditional Mediterranean diet, including whole cereals, legumes, seeds, fish, cruciferous vegetables, and many others, while control subjects were only given advise to increase the consumption of fruits and vegetables. This intervention is in a way a milder version of the Diet and Androgens (DIANA) Randomised Trial, that was induced changes in endogenous hormone metabolism, that might eventually result in reduced breast cancer risk. The DIANA intervention was based on reductions in the intake of total fat and refined carbohydrates, an increase in the ratio of n-3 over n-6 plus saturated fatty acids, and increased intakes of foods rich in dietary fibre and phytooestrogens.

In conclusion, a word of caution based on the diet & socioeconomic status associations observed in the Italian EPIC cohorts. The more disadvantaged socio-economic groups need most to change their current dietary habits, rich in meats and fats, and follow the more advantaged (and educated) groups that have already started to re-adopt more traditional Mediterranean habits. This would help decreasing the social inequalities in mortality and morbidity (possibly including cancer), currently observed in Italy and other southern European countries.

SESSION 2 :
FROM SCIENTIFIC EVIDENCE TO HEALTH PREVENTION ACTIONS

Round Table 1

ACTIONS : WHAT CAN BE DONE TO CHANGE BEHAVIOUR?

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Dr Laurent Damiens obtained in 1985 a Master of Business Administration in the University of Paris 9 Dauphine, and then a PhD in strategy, marketing and communication on " post-modern marketing" in the University of Paris 9 - Dauphine.

In 1986 he started working for Cartier in New-York (USA) in charge of marketing development and strategic communication.

In 1992 he started a new position for Sopexa, the French agency in charge of promoting the French food & wine all over the world. He was in charge of the fruit & vegetable sector for more than 4 years and then took the challenge to promote the French art of eating into Japan, and moved to Tokyo.
Since1999, he is the general director of Aprifel, the agency for research & information on fruit & vegetables, based in Paris. He developed the "fresh'attitude" concept, and created the "10 a day" strategy to promote the consumption fruit & vegetables. He also opened in 2001 an art gallery in Paris, la galerie fraich'attitude, centred into the concept of the eat art movement. The Gallery Fraich'attitude is now well recognised and proposes to the public exhibitions on specific artists or food themes, food design and contemporary creation.

Laurent Damiens is a fast&junk food fighter, and is dedicated to promoting a neo-vegetarianism lifestyle to interrupt the industrial abuse in our food, a tendency which has accelerated greatly in the past ten years. Giving meanings back to our foodstuffs, with the individual's total implication as a creator of emotions, through the daily act of cooking at home. Rethinking the way we eat, stimulating emotion through the use of cooking, creating, through taste, forms, textures, senses, colours and odours : rediscovering rich, deep sensations, as when one is creating and feeling, through the act of eating.

Advertising : a powerful tool to change food behavior

Laurent Damiens, Director of Aprifel, France.

The changing nature of food supply, which is moving from a natural food economy with many small fresh products suppliers, to a processed food industry economy managed by large multinational companies, has resulted in the marginalisation of fresh fruit and vegetables.

Nowadays, food supply is driven by a capitalist economy: concentrations and economies of scale have created strong majors that have been able to make substantial margins on processed products rich in cheap ingredients such as sugar and fat.

Those profits are then being re-invested in marketing and advertisement for processed products. As fresh sector industries hardly generate concentrations and economies of scale, fresh fruit and vegetables have been set aside the new food supply.

Communications and advertisement have become so influential in our societies that they have managed to generate growing demand for unhealthy processed products, and to change food perceptions and behaviours, which has resulted in the overall increase of processed food consumption.

Yet advertisement is a costly tool: only powerful industries may afford the entry ticket, while small fruit and vegetables companies simply cannot invest in mass media campaigns.

Thus, creating partnerships among fruit and vegetables professionals and with the public sector appears to be the most relevant answer: it shall allow to implement collective communications campaigns, jointly financed by private companies and public funds.

The case of France :

- Objective : to implement an effective communications strategy in order to foster behavioural and perception changes around fresh fruit and vegetables.
- Question : how can we counterbalance the advertisement of processed foods (high in saturated fat, sugar and salt)?
- Action : convey the concept of "Fresh Attitude" to the young generation, through a positive message stressing the benefits of a healthy lifestyle
- Results : after two years, the campaign has resulted in noticeable behavioural changes among young adults. The consumer panel study shows a two year consecutive increase of fruit and vegetables consumption by 10% in young targets: singles, couples and couples with children.
- Limits : when 1 euro is invested in advertising for fresh fruit and vegetables, the processed food companies invest more than 400 euros.
- Consequence : the fruit and vegetables sector needs more government support (locally, nationally and internationally) to improve the outreach capacity of its communication campaigns.

The way forward :

1. increase public financial support by up to 95% in order to counterbalance the marketing of unhealthy processed products
2. decrease the costs of mass media advertisement for campaigns that aim at raising awareness on this national and global Public Health issue.

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BIOGRAPHICAL SKETCH

Knut-Inge Klepp holds an MSc in nutrition from the University of Oslo and a MPH and Ph.D. in Public Health from the University of Minnesota.

He studies health behaviour among children and adolescents and interventions to promote health. He carries out research on the effects of promoting fruit and vegetables among school children in Norway and is the coordinator of the EU funded project "Promoting and Sustaining Health through Increased Vegetable and Fruit Consumption among European School children". He is a principal investigator of health promotion/intervention research on reproductive health and HIV/AIDS prevention targeting school adolescents in Sub-Sahara Africa.

He was member of WHO's Steering Committee on Child and Adolescent Health and Development. He is currently chair of the Norwegian National Council on Nutrition, and a member of the Executive Board of International Society of Behavioural Nutrition and Physical Activity.

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Promoting fruit and vegetables through schools A European perspective

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Several European countries have over the past few years developed school-based fruit and vegetable programmes that currently are being tested and evaluated. This presentation will review ongoing programmes with a special focus on experiences from the Pro Children study.

The Pro Children study is designed to assess vegetable and fruit consumption and determinants of the consumption patterns among European school children and their parents. A second objective is to develop and test strategies for promoting increased consumption of vegetables and fruits among school children and their parents. The study is a research project funded by the European Commission (2002-2006).

Surveys of national, representative samples of 11-year-old school children and their parents were conducted in nine countries during OctoberñNovember 2003, i.e. in Austria, Belgium, Denmark, Iceland, The Netherlands, Norway, Portugal, Spain and Sweden. Comprehensive school-based educational programmes were developed and tested in three settings, i.e. in the Bilbao region, Spain, in Rotterdam, The Netherlands, and in Buskerud county of Norway. A 24-h recall format and frequency items assessing regular intake were used to assess vegetable and fruit consumption. Determinants were assessed employing a broad theoretical framework largely based on the ASE model (Attitudes, Social Influences and Self-Efficacy), including cognitive factors, normative influences, skills and environmental barriers related to vegetable and fruit consumption.

The intervention programme builds on the current state-of-the-art within the healthy nutrition promotion tradition. Specifically, the programmes:
- Focus on specific eating behaviours related to vegetable and fruit consumption;
- Employ educational strategies that are directly relevant to a vegetable and fruit consumption and are derived from an appropriate theory for behavioural determinants;
- Devote adequate time and intensity in order to be effective;
- Include parental involvement and age-appropriate self-assessment and feedback in the form of computer tailred feedback;
- Include interventions targeting the school environment and also the larger community.

In this presentation, the focus will be on the school fruit and vegetable programmes employed in the Netherlands, Norway and Spain. The intervention programmes were tested using a group-randomized trial design where schools were randomly allocated to an intervention arm and a delayed intervention arm. Surveys among all participating children and their parents were conducted prior to the initiation of the intervention (September 2003; month 0), immediately after the end of the intervention (at month 8) and at the end of the subsequent school year (month 20).

Preliminary data from the project indicate that girls eat vegetables and fruit significantly more often than do boys across all participating countries. There are no sex differences, however, with respect to perceived availability of vegetables and fruit at home and outside the home setting. In all countries, perceived availability appears to be significantly associated with reported frequency of both vegetable and fruit consumption. Experiences from the school fruit programmes demonstrate that these programmes are well received among pupils and their teachers. Results from Norway show that when the programme is being offered for free to the pupils, it contributes to a significant and sustained increase in reported overall fruit and vegetable consumption. This positive effect is seen in pupils across socio-economic groups.

Experience and results to date indicate that school-based fruit and vegetable programmes represent a feasible and effective strategy to promote increased fruit and vegetable consumption among school children. However, cost to parents in paid subscription programmes seems to represent an important barrier in order to reach the large majority of pupils, and in particular in order to reach pupils of families of low socio-economic status.

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BIOGRAPHICAL SKETCH

Lorelei DiSogra, EdD, RD, is the Director of the National 5 A Day for Better Health Program (USA) at the National Cancer Institute. Dr. DiSogra has been a leader in the 5 A Day Program from its inception in California to its becoming the most recognized nutrition message in the United States and a global model for public-private partnerships to increase fruit and vegetable consumption. Committed to health promotion and disease prevention, Dr. DiSogra is a passionate advocate for eating a diet rich in fruits and vegetables.

Dr. DiSogra is responsible for key initiatives that include: increasing the availability and accessibility of fruits and vegetables in schools, such as the school fruit and vegetable snack program and salad bars; social marketing programs to increase fruit and vegetable consumption among men; and national dissemination of an evidence-based intervention for African American churches.

From 1991-2001, Dr. DiSogra served as Vice President for Nutrition and Health at Dole Food Company. Under her direction, Dole launched many school and retail 5 A Day programs to increase children's fruits and vegetables consumption. Dr. DiSogra collaborated with governments and NGOs to localize 5 A Day programs and build public-private partnerships to promote fruit and vegetable consumption around the world.

Prior to joining Dole, Dr. DiSogra was the Director of Nutrition Intervention Research, California Public Health Foundation, where she co-developed the California "5 A Day for Better Health" Campaign. Previously, she was an Adjunct Assistant Professor in Public Health Nutrition Program at the School of Public Health, University of California Berkeley.

Dr. DiSogra holds a doctorate in Nutrition Education and master's degrees in both Nutrition Education and Public Health Nutrition from Columbia University.

The Fruit & Vegetable Snack Program in the United States: A Case Study in Policy Development

Lorelei DiSogra, Center for Strategic Dissemination, National Cancer Institute, USA

All over the world, children's consumption of fruits and vegetables (F/V) is inadequate. In many countries children eat less than a half of the F/V recommended for good health. Increasing children's F/V intake is an important public health objective that will promote good health and reduce risk of chronic diseases. During the last 5 years the focus of efforts to increase children's F/V intake has shifted from nutrition education to changing their environment, that is, increasing the availability and accessibility of F/V in children's environments. The premise is that if you make F/V more available where children are, they will eat more. Based on this belief and preliminary research, many countries, including the U.S.A., have implemented school F/V snack programs. Results indicate that F/V snack programs effectively increase children's overall F/V intake.

In the United States a F/V snack program was first proposed by Senator Harkin, then chairman of the Senate Committee on Agriculture, in late 2001. As part of the 2002 Farm Bill, the F/V snack program was authorized at $6 million as a pilot program in 25 schools in 4 states and one Indian reservation for the 2002-03 school year. Schools in the 4 states (specified in the legislation) competed to receive funds to implement the F/V snack program. The 107 schools selected provided free fresh F/V snacks to students throughout the day. Elementary, middle and high schools used creative distribution concepts including kiosks, vending machines and in-class. Schools received $96 per student and were able to purchase any F/V they desired in the marketplace. Approximately 65,000 students enjoyed the F/V snack everyday at school.

The F/V snack program delivered big results immediately and was considered to be an unprecedented success, increasing children's F/V intake and creating a healthier school environment. Students, parents, teachers, food service staff, and school administrators all loved the F/V snack program; over 93% of schools wanted to continue. A Report to Congress, delivered in May 2003, details the evaluation of the pilot program. Very quickly the F/V snack program became known as a powerful model for how simply changing the school environment to include a F/V snack everyday results in healthier diets of students.

Funding the F/V snack program beyond the pilot phase was a challenge. The evolution from pilot to policy required:

- Personal champions
- Strategic leadership and risk taking
- A diverse coalition of committed partners
- Advocacy and lobbying
- Ownership by political officials
- Collaboration between health and agriculture sectors
- Relentless marketing of positive results to drive political will
- Passion

The enactment of the Child Nutrition and WIC Reauthorization Act in June of 2004 made the F/V pilot snack program permanent. With permanent funding of $9 million a year, the snack program was expanded to include a total of 8 states and 3 Indian reservations, reaching 130,000 students in 225 schools a day.

Although falling short of the original public policy objective to expand the F/V pilot program to all 50 states (25 schools/state) at an estimated cost of $42 million, the permanent funding status and expansion was considered a big achievement in a tight fiscal environment. Expansion of the program to additional states is now the policy objective. Accomplishing this will require continuous strategic commitment by all champions and partners, probably over many years.

National expansion of the F/V snack program to all 48.2 million students in the USA is estimated to cost $4.5 billion/year.

Although school-based F/V snack programs result in almost immediate behavior change --- children eat more F/V --- wide-scale implementation of such programs require a shift in policy priorities and funding commitments. Political champions, strategic leadership, collaboration of health and agriculture sectors, advocacy, coalitions, marketing, and passion will need to be aggressively coordinated and utilized over many years to foster expansion of these programs on a national level.

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Morten Strunge Meyer has a master in Food Science and Nutrition from the Royal Veterinary and Agricultural University of Copenhagen, Denmark.

In 1991, he joined the Danish Cancer Society, as Project Manager for Food and Nutrition Unit.
He was a Member working party: Fruit and Vegetables - Recommended Intakes, published by the National Veterinary and Food Agency in 1998.

He was involved in daily Management and member of the management board of the 6 a day-Research project, a National multidisciplinary research programme aimed at developing new and effective ways of increasing fruit and vegetable intake and sales. Three of which are on workplaces and schools : 1999 - 2003.

In 2000/2001, he was involved in Sabbatical study Public-Private Partnerships, California USA.

He was also a board member of the National School fruit programme in Denmark.

Morten Meyer was Co-founder and Member of the Executive Board, National 6 A Day campaign 2000-2003 and 2004-2007.

He was involved in the Developpment of National guidelines for meals in schools in collaboration with the Danish National Food Agency.

He was Member of the scientific and organizing committees of the 2, 3 and 4th international 5.
A Day symposia 1999, 2002, and 2004.

In 2004, he was a temporary Advisor to WHO on the WHO/FAO Global Initiative for fruits and vegetables.
He organized several international workshops on 1) School fruit programs, and 2) Nutrition prevention strategies.

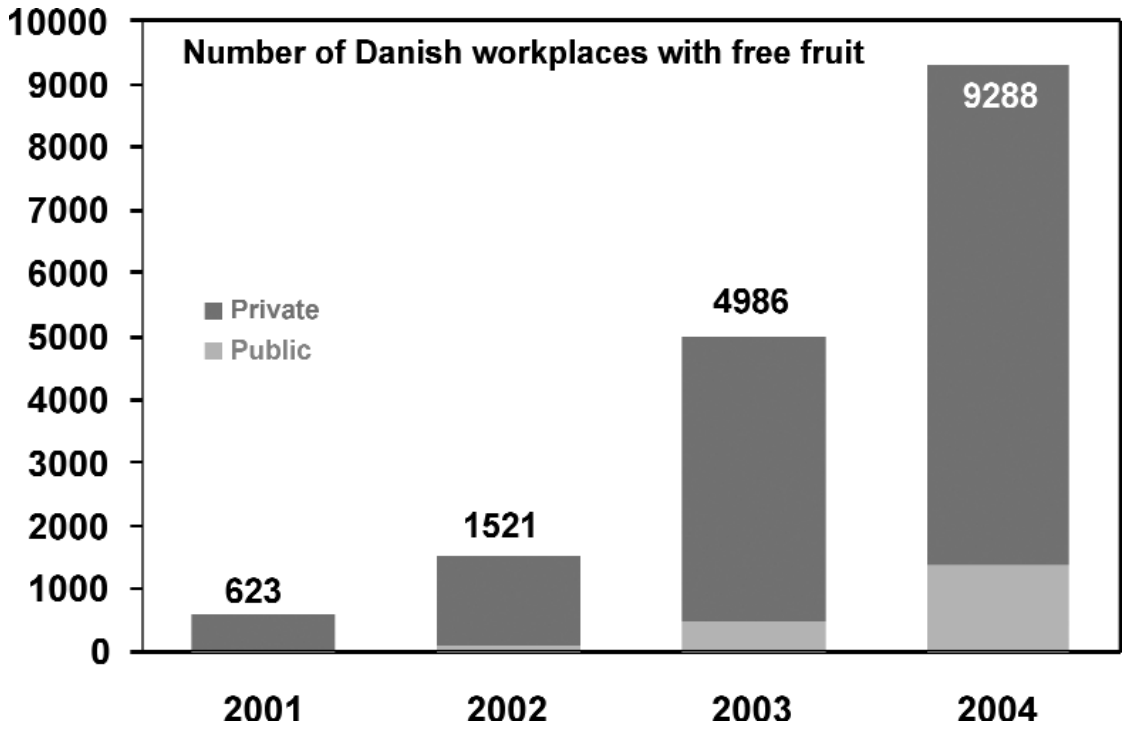
Effective and sustainable worksite-based interventions to promote fruit and vegetable consumption in adults

Morten Strunge Meyer, Danish Cancer Society, Denmark

A number of interventions, programs and studies have focused on increasing adults' consumption of fruits and vegetables. Many of these have made substantial changes in fruit and vegetable intake, but if "real life" criteria such as cost effectiveness, acceptability, speed at which changes can be made and sustainability of interventions are important – then only very few interventions stand out from the crowd.

Results from the Danish Workplace Fruit Program will be presented at EGEA III, including substantial increases in fruit consumption (0.7 servings/day). Perhaps more important, we also found that men cut their consumption of candy and cakes in half, when the Workplace Fruit Program is introduced. Data on national implementation of the program will also be presented.

How to motivate partners from different sectors to promote and implement the Workplace Fruit Program will also be discussed.



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BIOGRAPHICAL SKETCH

Mr F Marzano is Graduated in Jurisprudence

His main activity: Owner of an agricultural farmer producing fruit and vegetables for market and industry. Since the end of his university studies at the same time to his agriculture activity he always has been dedicated to the trade-union and representation's activities of the General Confederation of Italian Agriculture. Like many managers of the Confederation, he begun his own activity inside the A.N.G.A, of which, he became President of the section of Naples and subsequently Regional President of connection; in the second half of years ' 70.

In 1980 he was constantly engaged like President of the Union Agriculturists of Naples;

In April 1984 he was elected for the first time President of the Regional Federation Agriculturists of Campania;

In January 1988 he comes reconfirmed in loads;

In July 1989 he was elected member of the Executive Committee of Confagricoltura charged to President of the "Committee for the problems of Southern Italy";

In July 1992 he is confirmed for the second time member of the Executive Committee of Confagricoltura as Vice-president of Confagricoltura with delegation for the "fruit and vegetables Field";

From 25 January 1995 he is the President of the National Union between the Organizations of fruit and vegetables Producers, Citrus and of Fruit in shell (UNAPROA);

From 2001 to 2003 he was President of Inter-professional Association of fruits and vegetables field.

He is member (in representation of Confagricoltura) of the Advisory committee of ICE (Italian Trade and Development Agency).

The five colours of well-being: opportunities for consumers and producers

Fabrizio Marzano, Unaproa President, Italy

What we've done

In 2003, on the occasion of the Verona "Fieragricola" fair, UNAPROA (National union of organizations of fruit, vegetable, and nut producers) launched the "The 5 Colours of Well-Being" initiative aiming to increase fruit and vegetable consumption, borrowing from the American "Five a day the color way" experience. With this initiative UNAPROA intended to amplify the invitation to consume fruit and vegetables not only through five servings a day, but five servings of fruits and vegetables of different colours, in order to build the protective shield for our organism thanks to the presence of phytochemicals: blue/purple, green, white, yellow/orange, and red, "the 5 colours of well-being". The initiative immediately met with great success, so much so that the European Commission approved, the same year, a project presented by UNAPROA for a three-year campaign to promote the consumption of fresh fruit and vegetable products.

"Nourish yourself with the colours of life" is the slogan of the promotional campaign begun in June 2004, whose image – three smiling young faces framed by fruits and vegetables – stresses the connection between the liveliness and freshness of the faces shown and the consumption of fruit and vegetables.

The programme is based on a series of actions for publicizing to consumers the benefits deriving from the consumption of fruit and vegetables, whose messages have received the approval of the Italian Ministry of Health and the AGEA (Agricultural Payments Agency) itself.

The initiative, aiming to promote the consumption of fresh fruit and vegetables, is carried on with the scientific collaboration of the Institute of Food Science of the "La Sapienza" University of Rome, and aims to consolidate the results of the most recent studies and surveys on food consumption. These studies demonstrate how strong the tie is between diet and health and how people are increasingly aware of and sensitive to their well-being, which is achieved with a varied diet and active lifestyle.

The objective of the campaign is to reassert the "freshness" and "natural" nature of fruit and vegetables, and to promote their consumption, especially in the young age groups and in families, stressing that fruit and vegetables are indispensable for a healthy and correct diet, to protect our bodies' health.

The UNAPROA campaign envisages, alongside the advertising planning, other actions of communication and information:

- the production and distribution of a "Guide to Well-being", containing the nutritional aspects and organoleptic properties of fruits and vegetables, printed in a run of 4.5 million copies and distributed to gether with periodicals and in school and university cafeterias;
- the press office activity for the entire length of the campaign;
- the creation of a website with all information on the project, intended for consumers, with an area reserved for youngsters and containing briefings written by nutrition experts;
- the organization and holding of yearly events in the squares and streets of the most important cities in Italy. Moments of encounter and participation with the aim of raising awareness in citizens with regard to seasonal fruit and vegetable consumption, and of disseminating information on their nutritional principles.

The campaign, promoted by UNAPROA and carried out with the cofinancing of the European Community and Italy through the AGEA, envisages a total three-year investment of approximately 5.6 million euro.

The public financing is granted under Council Regulation (EC) no. 2826/00 and Commission Regulation no. 94/02 on information and promotion actions for agricultural products on the European Union internal market.

What we want to do

It is our intention to amplify as much as possible the "The 5 colours of well-being" message, with the various operators of the chain, so that consumers can adopt it as an actual lifestyle. Defending our health through the consumption of fruit and vegetables is something that improves our quality of living. It is an opportunity which we must not only defend, but strengthen through suitable diet styles and well-defined policy decisions.

Moreover, "The 5 colours of well-being" are an opportunity for the producers themselves and their organizations. The examples registered in other countries around the world which have already, for some time, launched similar promotional campaigns, confirm the positive increases in consumption and the economic results benefiting production. This is all thanks to a correct organization of the commercial relations that develop right through to the distribution phase.

How policy can support our initiatives

During the European Union's Agriculture and Fisheries Council meeting of this past 18 October, the fundamental role played by fruit and vegetables in a correct diet was stressed once again. This is only one of the latest events that confirm theories that have by now been verified at the international level. In spite of this general motivational agreement, the commitment of governments in this matter still appears too weak, considering the exiguity of the funds allocated for the promotion of fruit and vegetable consumption.

A broader view of the problem would enable us to consider the expenses for encouraging the consumption of fruit and vegetables as a great investment, because they contribute to reducing health care expenses. This is why a horizontal action of taxation exemption on fruit and vegetables through the various stages leading up to the consumer and, in any case, a harmonization, at least on the Community level through perhaps a directive on the subject, could be an essential element for achieving our objectives.

SESSION 2 :
FROM SCIENTIFIC EVIDENCE TO HEALTH PREVENTION ACTIONS

Round Table 2 :

HOW POLITICS ARE INVOLVED?
CAN PUBLIC STRATEGIES BE DEVELOPED?

Moderator
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BIOGRAPHICAL SKETCH

Dr Donato Greco is graduated in Medicine and Surgery, University of Naples (1971) with pecializations in Infectious, tropical and Subtropical diseases, (1974), Preventive Medicine and Hygiene (1977), University of Naples and Medical Statistics, University of Rome (1982).

He is Director General of Health Promotion, Ministry of Health since 2004.

He was Director of the Communicable Disease Unit, Laboratory of Epidemiology, Istituto Superiore di Sanità,Rome (1983-96); Director of Research, Epidemiology of Communicable Disease, Istituto Superiore di Sanità, Rome (1984-2004); Director, National AIDS Operational Centre, ISS, Rome (1987-1993); Director, Laboratory of Epidemiology and Biostatistics, Istituto Superiore di Sanità (1996-2003); Director, National Centre for Epidemiology, Surveillance and Health Promotion, Istituto Superiore di Sanità (2003-2004).

He has been a member of several European and Italian Commissions since 1983 to date.

Dr Greco is a member of several Professional Organizations: International Epidemiological Society; National epidemiological association; National Hygiene Society (SITI); Royal Institute of Public Health London.

He was an Expert, in the WHO Bacterial Disease advisory board between 1984 and 2002 in Geneva.

He was Director of the WHO Collaborating Centre for Health and Disease Surveillance, Istituto Superiore di Sanità, Rome from 1984 to 2004.

Dr Greco developed many professional and personal relationships with most of the countries in the EU accession list.

On behalf of the Italian Health Authorities, WHO, and European community Dr Greco conducted several evaluation activities in health systems specially in the field of Communicable diseases in several countries, including some East European countries (Turkey, Uzbekistan, Kosovo, Albania), and in many Italian Regions.

Dr Greco published more than 100 international scientific papers.

How politics are involved? Can national nutrition policies be developed? The case of Italy

Donato Greco, General Director of Health Prevention, Ministry of Health, Italy

Because of its nutritional qualities, the Mediterranean diet, which is rich in fresh foods, including large quantities of fruits and vegetables, is becoming more common in European countries outside of the Mediterranean. However, in Mediterranean countries such as Italy, globalisation and increasingly frenetic lifestyles have led to the importation of diets that often include nutritionally inadequate foods, which when consumed in excess can contribute to increasing the risk of certain chronic pathologies. For this reason, as specified in the program of the *Centro Nazionale per la Prevenzione ed il Controllo delle Malattie* (CCM) (Italy's National Centre for Disease Control and Prevention), public-health policies must provide support to the following activities:

a. the production and sale of foods or food groups whose habitual consumption is not associated with pathologies related to diet (e.g., heart attack, cerebral stroke, colon and breast cancer, and osteoporosis);
b. school programmes geared towards decreasing the consumption of high-calorie pre-packaged foods and beverages;
c. nutritional counselling provided by healthcare workers to patients/users on all possible occasions.

These activities must be performed as part of more extensive initiatives aimed at discouraging unhealthy habits and acquiring and maintaining a healthy lifestyle in general.

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Doctor Serge Hercberg is a Research Director at INSERM (French Institute for Health and Medical Research). He is the Director of the U557 INSERM (UMR Inserm/Inra/Cnam): Nutritional Epidemiology and of the Monitoring and Nutritional Epidemiology Unit (InVS/Cnam).

Dr Hercberg is Coordinator of several epidemiological studies in the field of evaluation of mineral and vitamin status of populations living in France and in Europe and in several developing countries (Africa, South America, Asia). He is a Principal investigator of the "Nutrition/Val de Marne Study 1988" and of the SU.VI.MAX Study (1994-2004) and also co- investigator of the European project EURALIM (CEE DGV) 1998.

Dr Hercberg is Chairman of the Steering Committee and Vice-Chairman of the Strategic Committee in charge of the French National Program "Nutrition and Health" (PNNS) (2001-2005).

RECENT PUBLICATIONS

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Public health nutritional policy in France: Nutrition Health National Program

Serge Hercberg, U557 Inserm (UMR Inserm/Inra/Cnam) and USEN (InVS/Cnam), France

In 2001, France set up a real public health nutritional policy by establishing, under the aegis of the Ministry of Health, "Programme National Nutrition Santé" (Nutrition Health National Program) (PNNS).
The 5-year initial phase, which was first scheduled to last 5 years, has been extended to 2008 within the framework of the objectives of Public Health Law.

The PNSS was set up in 2001 for the following reasons and circumstances:

- First, the main public health issues observed in diseases in which nutritional factors are involved: cardiovascular diseases, cancers, obesity, osteoporosis, diabetes… and which have major consequences on the human, economic and social levels.
- the progress of scientific knowledge related to the relation between diet and health. During the past thirty years, many scientific studies of cell organs, animals, on healthy and sick subjects, as well as at the level of populations have, with varying degrees of certainty, highlighted the role of nutritional factors (excess or deficiency) in the determinism of diseases. In many cases, the available data cannot establish with certainty the existence of a link between the suspected nutritional factor and the disease. However, in other cases the convergence of the arguments is such as to achieve international consensus and can be translated into public health recommendations;
- growing social demand, especially since health crises, the media coverage related to the increase of the prevalence of obesity, as well as the health arguments put forward by certain food processing manufacturers have made consumers aware of the impact of diet on health;
- political will, which has ensured the adoption of nutrition as a major theme in the field of health when France presided the European community in 2000.

Since 2001, the actions undertaken by the PNNS aim at promoting protection measures in the field of diet (and health lifestyle as related to diet) and reducing the exposure to risk factors in relation to chronic diseases and, among high-risk groups, to reduce exposure to specific problems.

Nine priority nutritional goals (about diet, physical activity and nutritional status) have been determined for the 2001-2008 period. Being resolutely pragmatic, the PNNS doesn't aim, in any case, at being exhaustive in the nutritional field. These objectives, though ambitious, do not aim at covering all nutritional problems of the French population. These are pragmatic and targeted proposals which can significantly improve the nutritional situation in population living in France. For the designers of these programs, reaching these objectives was not an aim in itself. However, the reduction of risk factors or the promotion of protection factors, as they have been determined, seem reasonable and reachable over the targeted period of time in addition to having a real significant impact in the long run on morbidity and mortality. Apart from these objectives aiming at the whole population, nine specific nutritional objectives aimed at specific populations have been defined.

On an operational level, the PNNS has developed a number of actions, measures, and rules in order to reach these defined objectives.

The different strategic main lines are oriented towards communication, information, the nutritional environment, research, monitoring and assessment.

The PNNS includes many sectors and associates all the partners involved in the filed: ministries (Agriculture, Consumption, National Education, Youth and Sports, Fight against Exclusion and Precariousness, the Elderly, Interior, Research); health agencies INPES (communication on prevention) , InVS (heath monitoring), AFSSA (food standard agency), Social Health system, Mutualist Federation National Committee on foods, INSERM (french institute for health and medical research), INRA (french institute of agnonomical research), Association of Food Producers, … and various scientific experts.

It is based on national and regional/local levels. The national level designs the recognized tools and offers a framework of reference for the essential development of fieldwork actions.

Actions are oriented towards different targets: general populations, high-risk groups, health professionals, education professionals, social workers, local and territorial bodies, associations and economic actors.

It relies on a number of important principles: respect of pleasure, conviviality and gastronomy; a positive approach, which is highly oriented towards the promotion of protection factors. It is never oriented towards prohibition and the development of messages is always adapted to lifestyles. It relies on the synergy, complementarity and coherence of all the developed actions.

No action, measure, tool can be considered, in itself, as really effective. However, only with the complementarity and synergy between the different actions can the nutritional aims be achieved.

The success of a public health nutritional policy, like the one developed by the PNNS, is grounded in a certain number of basic conditions:

- pertinent and achievable nutritional objectives;
- clear and scientifically recognized referentials (notably the translation of the objectives into recommendations for the general public or the intermediary professions);
- health strategies which respect pleasure and French dietary culture;
- pragmatic and understandable messages based on real-life situations;
- an involvement of all the actors: institutional and scientific; health, education, production, transformation, and distribution professionals, consumers…;
- various actions oriented towards the general public and the intermediary professions;
- measures directed at food disponibility, communication and information;
- a perfect connection between the local and national levels;
- complementarity, synergy and coherence between the different implemented actions.

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BIOGRAPHICAL SKETCH

Jean-Marie Le Guen is a Doctor in Medecine, graduated in High Studies in Economy of Health. He was a founder member of the independent and democratic U.N.E.F., in 1980 and Vice-President of the National Mutual Insurance Company of the students of France, between 1980 and 1982.

Between 1992 and 1995, he was a member of the High Committee of Public Health.

In 1983, he was Councillor of the 13th district of Paris. From 1988 to 1992, he was Deputy of the 9th district of Paris. In 1989, he was also elected at the Council of Paris, from which he became Vice-President in 1995. Between 1992 and 1997, he was a Regional Councillor of Ile-de-France.

In 1997, Jean-Marie Le Guen was elected Deputy of the 9th district of Paris (13rd municipal district) and re-elected in June 2002. He was named President of the Supervisory Board of the National Health Insurance Fund of the Salaried Workers between 1997 and 2002.

He is delegate of the French National Assembly to the Council of Europe and the Western European Union (UEO) as a member of the Commission of the cultural, familial and social questions, since 2002.

Dr Le Guen is responsible for the socialist party for the health and sickness insurance questions and he is the representative of his party at the High Council for the Future of the Health Insurance. He is also Chairman of the Parliamentary Study Group on Obesity.

RECENT PUBLICATIONS

> **Jean-Marie LE GUEN** -"L'obésité, le nouveau mal français" (« Obesity, the new French disease)-Ed. Armand Colin - In press.

Changing behaviour and environment requires statutory measures

Jean-Marie Le guen, National Assembly, France

The long-standing belief that France would be spared of the epidemic of obesity is now being challenged by the fact that obesity evolution in our country presents trends that are similar to the ones previously observed in the USA and elsewhere. According to projections, in ten years time, obesity will affect one young French person out of five, and over one out of two will remain obese adults. We are thus about to witness a real health crisis. The dramatic increase of obesity cases, especially among children, should change the way we view obesity: obesity is pathogenic and has to be considered as a disease perse.

Besides, not only will the epidemic of obesity affect individuals, but it will have a huge impact on our society. Although we cannot assess all implications of the evolution yet, some of them are likely to result in deep transformations of society.

Since they have not been able to identify the specific medical and genetic causes of obesity, most experts have focused on social and psychological conditions governing the epidemic's development. Their analysis stresses the role of individual behaviour and environment; an intervention targeting both levels thus proves necessary to prevent the expansion of obesity.

Over the past thirty years, our lifestyles have been deeply modified: this especially shows in our dietary behaviours and our transportation and leisure habits. These changes are recent and strongly correlated to the epidemic.

In order to influence these factors, intervention should focus on education and prevention. Public awareness campaigns, educational programs, grass-roots activities may educate and convey the need for better dietary habits and regular physical activity.

Effective intervention also has to target the environment, for the latter has become pathogenic. The food industry is both an actor and a beneficiary of the ongoing process of lifestyle transformation. Thanks to diversification and standardization of products, the food industry has captured a significant part of the food market. The health crisis we are facing is due in part to the market domination, trade power and overall goals and activities of the food industry.

In March, I brought in a legislative bill to the French National Assembly, in which I made specific suggestions on the implementation of a public health policy aimed at fighting obesity in a quick and effective manner.

The fight against obesity must be addressed through a global and consistent public health policy. I therefore recommend that obesity prevention be granted the status of national cause, so that it may be translated into broad-based prevention campaigns. A High Committee may also coordinate the fight against obesity following a multi-level approach (health, agriculture, trade-distribution, advertising, etc...).

Prevention should indeed play an important role in this policy. Prevention means, notably, informing parents, children, health professionals, etc... but also taking simple and concrete measures, such as encouraging the implementation of 30 minutes of daily exercise in schools. All this comes down to the
adoption of new behaviours: we need to learn how to balance our diet, improve our physical activity, avoid sn acking etc.

Accordingly, we need to promote the availability of healthy foods for all, while, on the contrary, put strains on the omnipresence of fatty and sweetened processed products and drinks. I thus proposed that vending-machines be removed from schools and replaced with drinking fountains of free mineral water.

We also need to take action on a broader level, by increasing the availability of healthy products such as fruit and vegetables. Nowadays, inexpensive fatty and sweet snacks stand to benefit from large promotional campaigns. We need to revert the trend in order to allow everyone, especially among the most underprivileged - who prove very much affected by the disease - to have access to a healthy yet low-cost diet.

The authorities have a major role to play in encouraging the promotion of fruit and vegetables, the education and information of consumers, as well as the monitoring of products quality. I hence propose that standard labelling of food products be modified: nutritional information (energy density, salt, fat and sugar contents) should be displayed clearly, in a way that is readable and understandable by all. In the case of unhealthy food composition (according to nutritional health standards), the authorities may request that a health education message be systematically displayed on labels, and could deny access to TV advertisement for the product.

Such measures would help modifying behaviours and detrimental environment features, in order to prevent obesity development. Influencing both aspects will ultimately allow to abate obesity.

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Antonia Trichopoulou is a Medical Doctor with State Certification in Biopathology (Laboratory Medicine) and has a Master in Public Health and a PhD in Nutrition and Biochemistry. Currently she is Associate Professor of Preventive Medicine and Nutrition and Director of the World Health Organization Collaborating Center for Nutrition at the Department of Hygiene and Epidemiology, School of Medicine, University of Athens.

She was president of the Federation of the European Nutrition Societies.

She has received numerous honors and awards including the Corato award (2001) and the IV Grande Covian Award (2002) for her studies concerning the health effects of Mediterranean diet. In 2003 she was decorated by the President of the Greek Republic with the Golden Cross of Honor.

Antonia Trichopoulou's research focuses on various aspects of nutrition and particularly issues concerning the Mediterranean diet.

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How politics are involved? Can national nutrition policies be developed? The case of Greece

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Nutrition has been recognised among the factors shaping current morbidity and mortality. In the context of a National Nutrition Policy, in 1999, the Supreme Health Council of the Hellenic Ministry of Health formulated dietary guidelines for adult Greeks. In 2002, the Greek Minister of Health and Welfare established the National Nutrition Policy Committee. The Committee's Members, after evaluating the nutritional situation in Greece, agreed on the following priorities:

1. Reduce childhood obesity
2. Increase the consumption of pulses and vegetables
3. Reduce meat and increase fish consumption.
4. Improve mass catering services, with the application of food quality principles.
5. Increase consumers' awareness on food safety and quality.

In accordance to the above priorities, five sub-committees were set and submitted reports to the Ministry of Health. The choices of modern Greeks, with respect to the consumption of vegetables, pulses, fish, meat and its products, based on national surveys, show a preference towards meat consumption. Moreover, a substantial proportion of the population fails to meet the Greek nutrition guidelines. A summary of the report dealing with this issue is presented below.

Distribution of Meat. From 1995-2001, domestic meat production declined, with the exception of poultry. Exports for the same period fluctuated, while meat imports increased steadily, a fact that underlines the national cost of the over-consumption of meat. A reduction in the consumption of meat would not only have beneficial consequences for the health of the population but also the economy of the country (if domestic production remained constant, reducing consumption by half would lead to a reduction of import costs by about 25%).

Distribution of Vegetables and Legumes. During the last few years, and perhaps due to extreme meteorological phenomena, the domestic production of vegetables decreased, leading to an increase of prices (with the consequent reduction in their consumption) and an increase in imports. The demand for legumes is met by imports, as domestic production is generally small. An increase in consumption of vegetables and legumes would require an increase of domestic production, with the corresponding reduction of prices and the consequent availability of abundant high quality products.

Distribution of Fish. Greece has intense fish farming activities. These activities fluctuated over the last years, with a tendency towards increasing exports. Imports are also important, particularly with respect to frozen and processed fish products.

Agricultural Policy . This is largely determined by the common agricultural policies (CAP) of the European Union. The CAP, via subsidies, influences producers in the choice of cultures and, via the price system, influences the sale prices of domestic and imported products. Thus, CAP is an important instrument for nutritional policy, by affecting production, distribution and market prices of foods. An increase of legume production requires setting of new objectives because Greek farmers prefer cultures that are more rewarding under existing Community legislation.

The Committee in order to accomplish the objectives of a national nutrition policy recommended three main actions

A. Training and education

Radio and television spots emphasising the health and culinary benefits of legumes, vegetables and fish
- Educational radio and television broadcasts explaining why reducing meat consumption and increasing consumption of legumes, vegetables and fish contributes to health and to the preservation of the Greek cultural identity
- Integrated interventions bringing together industry and the community with focal points schools and mass catering establishments.

Prevention and correction of unhealthy eating habits
- Seminars addressing health and mass catering professionals
- Active involvement of units at the interface of health and nutrition, including departments of dietetics in hospitals and health centres

Mobilisation of food industry, mass catering services and consumer unions
- Formulation of dietary guidelines and recommendations to be followed by entities belonging to the Ministries of Health and Education and stressing higher consumption of vegetables, legumes and fish and lower consumption of meat products
- Distribution of brochures, leaflets and posters guiding the consumer.

B. Research in the field of human nutrition
- Ongoing population based studies of the nutritional habits and choices of the Greek population as well as of the determinants of these habits and choices

C. High level collaboration among the Ministries of Health, Education, Agriculture and Commerce
- Formulation of an inter-Ministry panel to coordinate activities towards increasing consumption of vegetables, legumes and fish and reducing consumption of meat, particularly red meat

Source:

A. Trichopoulou, G. Golfis, M. Kammenou, A. Naska
Traditional diet and Globalisation: Nutritional priorities in Greece.
IATRIKH, in press (in Greek)

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She has published more than 200 papers in the field of nutritional epidemiology, especially on nutrition and CVD, nutrition and cancer, dietary interventions, dietary assessment methods, and nutrition monitoring.

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Finnish experience on national policies and strategies for chronic disease prevention

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The presentation describes the background and the historical development in Finland for action to influence lifestyles for prevention of cardiovascular and other major chronic diseases. The work in Finland from the North Karelia Project to national action is presented. The results show major changes in population lifestyles and biological risk factors, like blood cholesterol and blood pressure levels. This development has in 30 years been associated with 82 % reduction in North Karelia and 75 % reduction in all Finland in the age adjusted annual mortality of coronary heart disease among working age male population. Major elements of the successful national action in Finland have been the following: research (and role of national experts), health services (especially primary health care), North Karelia Project (national demonstration programme), health promotion programmes (NGOs, various coalitions, media activities), schools and educational institutions, industry & business, public policy & legislation, monitoring systems and international collaboration. Supportive public policy and increasing contribution by food industry was very much dependent on increasing interest and awareness of the population on healthier diets. The presentation discusses the experiences and emphasizes comprehensive strategies to promote availability of healthier choices, the role of good monitoring and the need for supportive public policy. The experience in Finland gives strong supportive evidence for the approaches of the WHO Global Strategy on Diet, Physical Activity and Health.

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Wilfried Kamphausen studied at the Universität des Saarlandes (D-Saarbrücken) and Heriot-Watt-University (UK-Edinburgh) (diploma in Applied Linguistics and Engineering), .

He started his career in German Federal Foreign Office in 1978.

He joined the European Commission in 1980; the posts he held include work in the linguistic service and in technology transfer and innovation support.

He has been working in the Commission's Public Health Directorate since 1994;
the posts he held include responsibility for the Community's "Europe against Cancer" programme and for various health promotion issues (healthy ageing, physical activity, equity in health/underprivileged groups, migration and health, young people's health and health promotion in health care settings).

His main focus of work in recent years has been on tobacco control legislation (Tobacco Products Directive, Tobacco Advertising Directive, WHO Framework Convention on Tobacco Control…)and on issues related to HIV/AIDS, nutrition/physical activity/obesity,
and prevention of lifestyle-related chronic diseases.

His present post in European Commission is Principal Administrator in Directorate-General "Health and Consumer Protection", Directorate C (Public Health and Risk Assessment), Unit C4 (Health Determinants).

Community action on autrition and physical activity

Wilfried Kamphausen, European Commission, Luxembourg

It is only with the Maastricht Treaty that the European Community received a formal competence for public health issues. This mandate is still fairly limited, as the organisation and delivery of health services and medical care remain under the responsibility of Member States.

However, the considerable increase of overweight and obesity in practically all Member States of the European Union shows that policies aimed at promoting healthy diets and physical activity are required at all levels, including the European level. In fact, the prevalence of obesity (defined as Body Mass Index >30) has increased by 10-40% across Europe over the last 10 years; if this trend continues, two thirds of all Europeans will be overweight (BMI > 20) or obese by 2020. Particularly worrying is the increase of overweight and obesity among children and adolescents (present EU average: 20%).

Obesity and overweight are important risk factors for diseases like type-II diabetes, heart disease, hypertension, stroke and certain forms of cancer. The increasing obesity rates are the result of an increased consumption of energy-dense foods along with reduced physical activity.

At Community level, the most relevant tool for implementing actions in the nutrition field is the Public Health Action Programme (2003-2008, 351 M), which foresees *"strategies and measures, including those related to public awareness, on life-style related health determinants, such as nutrition, physical activity … including measures to take in all Community policies and age- and gender-specific strategies".*

The longer-term objective is the development of a comprehensive and coherent Community strategy on nutrition and physical activity. Such a strategy would build upon the World Health organisation's "Global Strategy" which was adopted in May 2004, and would need to cut across a range of Community policies (agriculture, education, research, enterprise…).

Of particular importance in this context is the creation of a new forum, called "Diet, Physical Activity and Health – a European Platform for Action". The Platform will bring together all relevant players active at European level that are willing to enter into binding and verifiable commitments that could help to halt and reverse current obesity trends, and thus contribute to diabetes prevention. It will also enable all individual obesity-related initiatives to be more promptly shared amongst potential partners and emulators across the European Union as a whole.

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Prof. Antonios Trakatellis is Vice-President of the European Parliament and Member of the Parliament's Bureau. He is a member of the Committee on the Environment, Public Health and Food Safety, and Substitute of the Committee on Industry, Research and Energy.

He is also a member of the Delegation for relations with the countries of south-east Europe, and Member and Vice-Chairman of the Delegation to the Euro-Mediterranean Parliamentary Assembly.

Prof. Trakatellis is graduated in medicine (Athens 1955). He has a Doctorate in medicine (Athens 1958). He is graduated in chemistry (Athens 1961) and Specialist in microbiology and biochemistry (1961). He was a Research associate and an assistant professor at the University of Pittsburgh, Pennsylvania, USA (1961-1964)and a Research associate at Brookhaven National Laboratory, New York (1965-1968), Assistant professor of biochemistry and subsequently professor at Mount Sinai school of medicine, City University of New York (1968-1972), Professor of Biochemistry at the Aristotle University of Thessaloniki (since 1972). He was also, Principal of the Department of Medicine (1986-1989) and Rector of the Aristotle University of Thessaloniki (1988-1994).

Prof. Trakatellis is a Member of the Committee on European Affairs in the Greek Parliament (from 1999), MEP (from 1994), Leader of ND Group of MEPs (2000-2004). He is a Member of the EPP (from 1999), Chairman of the delegation for relations with the transcaucasian republics (1994-1997) and Vice-Chairman of the EU-Romania Joint Parliamentary Committee (1997-1999). Chairman of STOA (1999-2004).

Prof. Trakatellis has published over than 140 original scientific publications, 10 books in the field of biochemistry and has more than 2000 citations in international journals concerning insulin, nucleic acids 'protein' and vitamin B6 deficiency in immunological phenomena.

Closure

Antonios Trakatellis , European Parliament, Brussels, Belgium

SESSION 3 :
TOWARD NATURALLY NUTRIENT RICH SNACKS : Global Trends in Snacking Behaviour

Chairman
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BIOGRAPHICAL SKETCH

Dr Adam Drewnowski obtained his PhD in Psychology at The Rockefeller University in 1978.

Following postdoctoral training at the University of Toronto, rejoined The Rockefeller University as Assistant Professor in the Laboratory of Human Behavior and Metabolism and became engaged in obesity research. He then moved to the University of Michigan, where he became Professor of Public Health, Psychology, and Psychiatry and headed the Program in Human Nutrition at the School of Public Health. He joined the University of Washington in 1998.

In 1997, he was Chercheur Invité, Institut Scientifique et Technique de la Nutrition et d'Alimentation, Conservatoire National des Arts et Métiers, Paris, France.

Research interests are in taste and food preferences, studies on obesity and health disparities, new tools for assessing nutrient density standards and diet quality, nutrition and disease prevention.

Dr. Drewnowski is the Director of the Center for Public Health Nutrition, the Exploratory Center for Obesity Research, and the Nutritional Sciences Program, all at the University of Washington.

RECENT PUBLICATIONS

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Nutrient density as a tool for health promotion: Introducing the Naturally Nutrient Rich (NNR) Index

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The diet of Western societies is said to be increasingly energy-rich but nutrient-poor. There is mounting pressure to develop a nutrient density standard that is a measure of the foods' nutrient content in relation to the energy they provide. Food labels and health claims could be based on the nutrients-to-calorie ratio, as an alternative to a specific minimum amount of a nutrient per serving size. The nutrient density approach would allow consumers to substitute foods in their diets with healthier and more nutrient-dense options. Because of their low energy density, vegetables and fruit are very rich sources of vitamins and minerals relative to the calories they provide. However, no agreed-upon measures of overall nutrient density as yet exist. There are no criteria as to what nutrients and in what amounts define a nutrient-rich foods or a healthful beverage. Attempts to evaluate nutrient density have been based on calories-to-nutrient scores, nutrient-to-nutrient ratios, and nutrients-per calorie indices. The new Naturally Nutrient Rich (NNR) Index score is based on mean percent daily values for 14 nutrients. It can be used to assign rank foods along the dimension of nutrient density and to calculate nutrient adequacy and nutrient density scores and the nutrient to price ratio. This approach has major implications for regulatory agencies and food labeling, for implementation of nutritional policies in schools and for consumer education. In particular, the NNR index score allows consumers to select nutrient dense foods first and monitor the nutrients to calorie ratio. Given the current dietary trends, the nutrient density approach is a valuable tool for nutrition education and dietary guidance.

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Jane Wardle is Professor of Clinical Psychology and Director of Cancer UK's Health Behaviour Unit in the Department of Epidemiology and Public Health at University College London.

She studied Psychology and Physiology at Oxford University and then trained as a clinical psychologist at the Institute of Psychiatry, before concentrating on research into behavioural prevention of cancer. One theme of her recent work is children's eating behaviour.

RECENT PUBLICATIONS

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Predictors of fruit and vegetable consumption by children

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This paper will consider three classes of influence on children's intake of fruits and vegetables: the food itself, the child's experience with the food, and the child's temperament, and discuss the implications for increasing children's fruit and vegetable intake.

Liking is an important influence on acceptance of food [1] and vegetables almost always feature among children's least-liked foods [2]. In contrast, fruit is often liked, but neither fruit nor vegetables are eaten in the quantities recommended for a healthy diet.

Some foods start off ahead of others in terms of liking. From the earliest age, children prefer sweet-tasting foods; which is assumed to be because sweetness is a signal for energy content. This view gets some support from finding that energy-dense foods are preferred over equally sweet, but less energy-dense foods [3], an effect that could extend to the energy-density of the formulations (e.g. fries over boiled potatoes). As well as the properties of the target food, psychological theory suggests that liking may be influenced by the alternatives; availability of a better-liked option might reduce liking for the target food. This could contribute to under-consumption of fruit which is often served as a snack where it competes with much sweeter and more energy-dense options. Current hunger state could also modify preferences both at the time of consumption and in terms of learned changes in preference [4,5].

The most important aspect of experience is familiarity, with familiar foods being consistently preferred to unfamiliar foods. Recent work suggests that familiarity with tastes might be achieved by exposure in breast milk, and exposure early in life might be particularly important for later acceptance [6]. Increasing familiarity is a mechanism for promoting acceptance of previously disliked foods [7,8]. Both animal and human studies suggest that the familiarity effect can be achieved vicariously through observing others eating the food; a possible mechanism for parent-child similarities. Another important aspect of experience is the consequence of consumption. Post-prandial sickness is a reliable means of making people dislike the taste of foods eaten before, and animal studies show that the opposite is also true – animals learn to like foods that reduce symptoms of nutrient deficiencies, although there is no comparable evidence in humans, except possibly the energy-density effect. Unfortunately positive consequences can't easily be reproduced with external rewards; the evidence suggests that rewards can promote consumption while the contingency is in operation, but may at the same time reduce liking for the food [8].

On top of the communalities in food preferences, children also appear to vary in their acceptance of fruits and vegetables. Liking for certain fruits and vegetables has been hypothesised to be genetically determined, related to the PROP-tasting characteristic. However, analyses of the heritability of food preferences have produced mixed results. This is partly because sample sizes tend to be small. We used a large sample of same-sex twin pairs to investigate the heritability of food preferences in 5-year-old children, using a large set of foods which were grouped on the basis of the factorial structure of food preferences [9]. The results for individual foods were variable, but in combination, heritabilities for 'Vegetables' (0.24), 'Fruits' (0.46) and 'Dessert foods' (0.22) were significant but modest, while heritability for 'Meat and Fish' foods (0.76) was significantly higher [10]. One pathway through which heritable characteristics could influence food preferences is temperament, specifically food neophobia – a reluctance to taste new foods. Our results show that neophobia is strongly related to liking for fruits and vegetables [11,12] but not to desserts, which we have hypothesised could be because neophobia reduces the child's ability to become familiar with – and thereby grow to like - foods that are less instantly likeable.

Our experience with parents whose children are reluctant to eat fruit and vegetables indicates that i) parents believe that food preferences are stable traits, ii) they choose largely unsuccessful strategies to promote intake of fruit and vegetables, and iii) they are low consumers themselves. On the basis of our research we propose that fruit and vegetable consumption could be promoted relatively easily by introducing them early, using small taste exposures for unfamiliar foods, modelling consumption, offering choices within fruits or vegetables and not with other snack foods, and avoiding bribes or health warnings [13,14], along with recognition that fussy (neophobic) children need special care when introducing new foods. The right kind of parental control is likely to be a benefit, not a hazard, in developing healthier food choices.

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Susan is also Head of the Nutrition Communication group at HNR and works extensively with government, industry, health professionals, the media and consumer groups to develop effective public health strategies to tackle obesity and other nutrition-related issues.

Susan is currently Chair of the UK Association for the Study of Obesity and a member of the Joint Health Claims Initiative Expert Panel, assessing nutrition-related health claims in the UK.

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Snacking and Obesity

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Most of the discussion regarding the Mediterranean diet focuses on diet quality, frequently promoting high intakes of olive oil, fish, fruit, vegetables and wine with an implicit message to decrease consumption of certain other items. However there has been much less attention paid to eating behaviour, including the frequency of food consumption. The classical Mediterranean diet places much greater emphasis on meal-eating, as opposed to the snacking schedule common in the USA, UK and an increasing number of other countries. These 'snacks' may be consumed any time, any place and often in the absence of hunger, rather than at defined meal episodes. They are frequently based on convenient ready-prepared food and drink, rather than freshly prepared traditional ingredients that feature in the Mediterranean diet. The rise in snacking has frequently been implicated, especially in the popular press, to the increased prevalence of obesity.

However in considering the impact of snacking on weight and health it is necessary to consider the effect of the frequency of food consumption, the type of foods consumed and the extent to which 'snacking' may simply be a marker of a broader lifestyle linked to adverse effects on weight rather than a causal mechanism per se. Physical inactivity is particularly important and research shows that a tendency to sedentary activities is associated with altered eating habits, including increased consumption of savoury snacks and reduced consumption of fruit and vegetables.

Epidemiological studies of eating frequency and weight are inconclusive since these analyses are confounded by errors in the reporting of dietary intake and frequently lack data on physical activity. Overall there is a tendency for obese people to report fewer eating episodes than their lean counterparts, although this may be a function of the greater tendency to under-report total energy intake and/or a post-hoc effect in which obese individuals skip meals in an effort at weight control. Experimental studies in which meal frequency is manipulated under iso-energetic conditions show no difference in energy expenditure and no effect on energy balance over a 24-hour period. However this provides few insights into the effect of meal frequency in the free-living condition when total energy intake is unconstrained and individuals are allowed to select from a variety of food and drink.

The type of food consumed may be a critical factor, yet dietary surveys show that only a small proportion of energy intake is derived from 'snack' foods. For example, the UK is the largest consumer of savoury snacks in Europe yet, on average, this accounts for only about 3% of energy intake. The increased risk of obesity may relate not to the average consumer but the heavy user and attention has focused on some of the physical properties of foods consumed as snacks that may increase the risk of over-eating and subsequent obesity. This includes energy density (particularly in relation to fast food and savoury snacks) and liquid calories (soft drinks). This presentation will discuss the evidence in relation to each of these items in the context of obesity.

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RECENT PUBLICATIONS

> Co-editor with Jeanine Louis-Sylvestre of "Eating behaviours" (in French), Tec & Doc, Lavoisier Eds, 2004.
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> **Chapelot D** et al. A role for glucose and insulin preprandial profiles to differentiate meals and snacks. Physiol Behav 2004;80(5):721-31.
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Metabolic responses to snacks: leptin, ghrelin and insulin

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How appeared the necessity to distinguish between meals and snacks?

Of course, animals eat when they are hungry…or when they are not. This could also be summarized by: all hunger signals lead to eating but eating is not always motivated by hunger. Thus, providing only chow or a wide variety of high-palatable food items leads to striking differences in energy intake and body weight gain. The latter was called the cafeteria diet. That the rat under a cafeteria diet is not always hungry before eating is highly suggested by the fact that in presence of these cafeteria food items, eating is re-initiated during a usual satiety period. The question is: do we really need to take in consideration if the animal is hungry or not hungry when eating is initiated? The question that immediately follows is: is this relevant to human eating behaviour?

If biological parameters may distinguish between eating in a hungry state and eating in a non-hungry state, this would argue strongly for a distinctive mechanism between these two behaviours. This was actually shown first in rats (1): when these animals are fed on their usual monotonous chow diet, the onset of eating is preceded by a decline in blood glucose whereas this blood profile is not observed before the consumption of a newly introduced high palatable food (2). Given the body of evidence that glucose is a metabolic signal for the central nervous system that triggers the initiation of eating, this led to propose that food intake following a glucose decline should be considered as a meal, all others being determined by others factors than energy (and more specifically glucose) depletion.

Meals and snacks in relation with insulin, leptin and ghrelin blood profiles

We recently showed that this discrimination was possible to observe in humans (3). Young male subjects who use to take everyday between 4:00 and 5:30 a meal that is called in France the "goûter", were compared to subjects who never eat anything between lunch and dinner. In the latter group, half subjects were provided with palatable food in the same time period. All ate at least some of the available food items. It was found that a decline in blood glucose occurred before this eating occasion only in usual goûter eaters. Not only glucose but also insulin displayed this pre-prandial blood decline. We were reinforced in our conviction that meals must not be confused with these eating episodes occurring in a satiety state that we had previously decided to call snacks. This was sometimes criticized because snack only indicates something not eaten during the 3 main meals (breakfast, lunch and dinner) but this paradigmatic 3-meal pattern seems more culturally than scientifically defined.

None of the other blood parameters involved in eating behaviour helped to discriminate meals and snacks. However, leptin brought interesting additional information. Leptin is secreted mainly by adipocytes and among several ubiquitous actions, is considered as a satiety factor. In humans deprived of time cues, we had previously found that leptin was involved in the amount eaten and in the satiety duration (4). In this new study, leptin level at the onset of this afternoon eating occasion was actually negatively correlated with the amount eaten, either it was the goûter or the snack (3). The influence of leptin on amount eaten thus does not seem disrupted when eating is not motivated by a physiological need.

Ghrelin is secreted mainly by the stomach and considered by some as a factor involved in the initation of the meal because its plasma concentration increases before meals (5). However, hitherto only its orexic properties have been demonstrated. We have found that ghrelin blood profiles during a normal lunch-dinner interval is characterized by a fast decline during the 30 min. following lunch and an increase in the late part of this interval, with a large variability between subjects but usually from 60 to 120 min. before dinner (6). We have recorded ghrelin profiles in usual goûter eaters and observed that this eating occasion is actually preceded by a small but significant increase in ghrelin level (personal data). We have still no data on snack eaters, but this ought to be explored in the next future.

It is important to note that all the new discovered agents have not modified the model according to which insulin is the pivotal step linking the metabolism to the eating behaviour. Thus, both leptin and ghrelin are correlated with insulin, with a positive and negative coefficient respectively.

Responses to meal or snack: need for future research

In a first series of studies on the metabolic consequences of snacks in humans, we had shown that the detrimental effects of snacks on energy homeostasis was partly mediated via the snack–induced insulin secretion and the consecutive reduction in availability of fatty acids (7). In a further study, blood leptin at dinner onset was not increased by the snack (3) helping to explain why intake at dinner was found similar in the snack and the non-snack conditions. Thus energy intake provided by the snack was added to the body stores and not compensated for.

Consequences of snacking on ghrelin are currently not known. We have observed (personal data) that blood ghrelin does not increase between the goûter and the dinner (spontaneously requested) leading to concern on the proposed meal-driven properties of this hormone. Moreover, the postprandial decrease of blood ghrelin does not seem mandatory but needs the ingestion of carbohydrate (8). Work Further studies are thus needed for assessing if snacks (eg. consumed in the afternoon) lead or not to a decrease in blood ghrelin after consumption and an increase before the next meal (eg. dinner). This would shed a light on snacks and particularly on ghrelin consequences in the metabolism.

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POSTER ABSTRACTS

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Objectives : The Mediterranean diet score (MDS) and the Healthy Eating Index (HEI) are two measurement tools of diet quality, based on different concepts. The objective of the present study was to analyze the association of these diet quality indices with lifestyle, energy density, and macronutrient intake at population level.

Methology : The subjects were Spanish men (n=1547) and women (n=1615) aged 25-74 years who were examined in 1999–2000, in a population-based cross-sectional survey in the north-east of Spain (Girona). Dietary intake was assessed using a food frequency questionnaire. A Mediterranean diet score, including foods considered to be characteristic components of the traditional Mediterranean diet and, the HEI (based on a 10 component system of five food groups, four nutrients, and a measure of dietary variety of food intake) were created. Detailed information of leisure-time physical activity, smoking and alcohol drinking habits was recorded.

Results : Generally, a higher diet quality was found with increasing age. Hence, all further associations were adjusted for this confounder. Increasing diet quality, characterized through the MDS and HEI, was inversely associated ($p< 0.05$) with smoking and sedentary lifestyle in both genders. Elevated alcohol consumption was more frequent in men with a low rather than a high diet quality level.

Both diet quality indices showed a similar association, according to direction and magnitude, with macronutrient intake expressed in percentage of energy intake and energy density (calculated by three different methods). Diet quality was directly associated with intakes of carbohydrates and inversely related to total fat, saturated fat, and protein ($p<0.01$). In contrast, the intakes of mono and polyunsaturated fat were inversely associated with the HEI ($p<0.01$), but showed no significant relationship with the MDS. Low energy density was associated ($p<0.01$) with higher diet quality, independent of the measurement tool used.

Conclusion : In general, the MDS and HEI showed a great similarity according to their associations with lifestyle variables, macronutrient intake, and energy density in both genders. High adherence to a good quality diet was associated with a healthier lifestyle, higher consumption of carbohydrates and lesser intake of total fat, saturated fat, and protein in men and women. Most importantly, regarding energy balance, high quality diet is inversely related to energy density.

Relationship between folate status and the healthy eating index in a group of schoolchildren

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The Healthy Eating Index (HEI) is a tool that allows us evaluate the quality of a diet of a population. Even though global diet deserves a special attention, folate acid deficiency may be relatively frequent in developed populations and this may have strong sanitary and functional repercussions.
Objective : To study the relationship between the HEI scoring and folate status in schoochildren.
Methods : It has been studied a group of 128 schoolchildren from 7 to 10 years from Madrid (Spain). The dietetic study was carried out by a food record for three days and the "precise individual weighing" for meals carried out in the school's dinning. Food was transformed in energy and nutrients, subsequently we can valuate if the diet is adecuate to the RDI of folate. We also calculated the HEI. Blood samples were obtained for serum folic levels evaluation.
Results : The score obtained for the HEI was 64.7± 9.9, only 43.8% of the population covered the folate RDI. However, as diet's quality increased it did also the contribution of folate intake to the covering of the RDI (r=0.39, p<0.001). Besides, it was observed a positive association between the HEI and the serum folic levels (r=0.18, p<0.05).

ANOVA	Poor Diet (score <50)	Needs improvement (score 50-80)	Good diet (score >80)	
Children	11	109	8	*
Folate intake (µg/d)	201.6±43.0b*	245.2±66.2	284.8±64.2b*	*
Coverage of RDI (%)	80.7±17.2b*	97.9±26.5	113.9±25.7b*	*
Folate density (µg/1000 kcal)	87.7±9.6a**b*	116.7±30.1a**	126.9±21.8b*	*
Serum folic levels (ng/mL)	8.4±3.7b*	10.1±5.6c*	12.1±7.2b*c*	*

Equal letters mean significant difference between the groups. **p<0.01, *p<0.05.

Conclusions : Even though more studies are needed in this field, the fact that the intake of folic acid increases together with the HEI supports the using of this index to evaluate the status of folate.

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P03

Only a minority of Spanish adolescents consumes an adequately-composed breakfast– Regional results from the AVENA* Studyl

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Introduction : An adequately composed breakfast can essentially contribute to cover daily nutrient needs, especially during childhood and adolescence[1].
Objective : Assessment of breakfast habits of Spanish adolescents.
Methods : Breakfast habits of 1282 adolescents (13-18.5 years; 572 males) from Santander, Zaragoza, Granada enrolled in the AVENA study[2] (a randomised, cross-sectional multi-center study carried out in Spain) were assessed using a validated food frequency questionnaire. For the evaluation of the nutritional quality, the food pattern consumed was compared with a predefined "optimal" breakfast consisting of one portion of milk (pure or cacao) for calcium needs, one portion of carbohydrate-rich food (toast, granola, cereals) for delivery of energy and dietary fibre and one portion of fruit or their juices (for vitamins and minerals). Age, gender as well as regional differences were analysed by Chi-square test (level of significance $p<0.05$).
Results : 13.2% of the adolescents consumed an adequately composed breakfast with significant geographical differences (Santander: 19.4%, Zaragoza: 9.4%, Granada: 10.5%; $p<0.001$). Gender differences were only found in Zaragoza (boys: 14.1%, girls: 5.9%, $p<0.001$). Most of the students did not choose fruit or juice. Six point three percent of all students did not consume breakfast at all; the number of "non-consumers" being influenced by gender (girls: 8.6%, boys: 3.5%; $p<0.001$). The percentage of girls skipping breakfast increased continuously with age (13 years: 1.7%; 17-18.5 years: 13.5%; $p<0,001$).
Conclusion : Only a minority of adolescents in three urban Spanish Areas consumed an adequately-composed breakfast, because they omitted fruits. Since breakfast can essentially contribute to an adequate daily nutrient intake, this is an obvious risk for a generally too low provision of certain nutrients like vitamins and minerals.

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Food habits in Spanish institutionalized elderly group. Adherence to the Mediterranean Diet

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Objective : Mediterranean Diet (MD) has been described as a model from a nutritional and sanitary point of view due to the proportion in which all the food groups are included. Nevertheless, in the last years, changes in the reduction of calories consumption and expenditure, the incorporation of low nutrient dense foods, and food processing methods have contributed to increased the risk of deficiences intakes, in particular among certain population groups, as the elders. Knowing the extent of this reality is the reason why the aim of this study was to evaluate the food habits in a group of institutionalized elders.
Methodology : The analysis included 54 males and 98 females aged ≥65 y who were living in 3 geriatric residents in the Community of Madrid (Spain). Dietary intake was assessed using a "Precise individual Weighing" during 7 days. Daily serving of each group of foods was compared with the recommended for the MD established by Ortega et al. (1998).
Results : Results are shown in Table 1.

Table 1. Daily servings intakes of the different groups of food. Comparison with the daily recommended servings (DRS) for MD (X±SD). Differences depending on the sex.

	DRS for MD	Daily serving intake		Daily serving intake		
		Total sample		*Men*	*Women*	COV
Cereals and pulses	6-10	3.27±0.942	***	3.78±0.761	2.99±0.921	***
Fruits	2-4	1.20±0.70	***	1.01±0.41	1.30±0.80	**
Vegetables	3-5	1.75±0.54	***	1.88±0.60	1.68±0.51	-
Dairy Products	2-3	2.10±0.64	*	2.04±0.64	2.13±0.65	*
Meat, fish and eggs	2-3	1.43±2.2	***	1.59±0.40	1.34±0.38	*

COV: (Covariance analysis adjusted by discrepancy energy intake/expenditure); * p<0.05, **p<0.01, *** p<0.001.

Conclusion : Our results provide evidence supporting the progressive withdrawal from traditional MD even in elders. Introduction of corrective policies or a initiate campaings to inform the consumer about the necessary changes in the diet and about characteristics of the MD, which are being lost and should be restored.

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P05

Adequacy of food intake compared with the Mediterranean diet in a group of young women depending on smoking habits

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Objective : To analyze the consumption of different groups of aliments in a group of smokers, passive smokers and non-smokers women, compared with the Mediterranean diet profile.
Materials and Methods : The study subjects were a group of 319 women aged 18-35 y (112 smokers, 100 passive smokers and 107 non-smokers), all of them living in the Community of Madrid. A prospective method using a three day food record was followed for three consecutive days including a Sunday, reporting the portion size of each meal in order to obtain the grams per day consumed.
Results : The consumption of cereals after adjusting for energy intake, is higher in non-smokers (159.3±76.0 g/day) than in smokers (145.6±69.1 g/day) and passive smokers (141.2±60.0 g/day) ($p<0.05$), being in all cases this consumption lower than the recommended. Besides, smokers, both actives and passives, consume less vegetables (235.8±122.0 g/day in actives and 231.1±108.4 g/day in passives) than non-smokers (272.1±124.1 g/day) ($p<0.05$). It is verified in the three groups a discrepancy between real and recommended consumption related with cereals and vegetables, being this discrepancy more accused in smokers women. On the other hand, smokers have a lower consumption of olive oil (24.2±12.0 g/day) than non-smokers (27.9±13.7 g/day) and passive smokers (28.1±13.7 g/day) ($p<0.05$).
Conclusions : Smokers, both actives and passives, consume a lower amount of the characteristic foods of a Mediterranean diet such as cereals, vegetables and olive oil. Therefore, added to the danger due to tobacco exposure, which is a major risk factor of a great number of diseases, keeping a more incorrect diet could get worse the negative effects of smoking on health.

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Differences between of the habitual consumption with regard to what consider an adequate diet in a collective of physically active young

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Objective : To know the food habits of physically active young people and to evaluate the differences among the habitual consumption compared to the one considered correct, to determine if there exists a need of improvement (in practice and /or in theoretical level).
Method: There was studied a group of 111 physically active individuals (77 males and 34 women) from 20 to 35 years that carried out an average of 7.8 ± 4.8 hours/week of physical activity which have as main motivation the improvement of health, aesthetics and weight control.
For the dietetic study there was applied a "Food frequency questionnaire". Besides, the individuals were asked about the frequency they believed that the different food should be consumed.
Results : The studied individuals think that they should consume more portions of pasta/rice, cereals, vegetables, fruits and fish compared to what they take actually. Both the habitual consumption and the one considered suitable are away from the guides marked for sportsmen (sportswomen), specially in relation with the cereals and with the vegetables (1).

Table 1. Consumption habitual and considered advisable by the studied individuals
(Rations / day)

Food group	Habitual Consumption	Think that they must consume
Pasta/rice	1.0 ± 0.6***	1.3 ± 0.3***
Cereals	2.8 ± 1.6***	4.0 ± 2.6***
Vegetables	1.0 ± 0.7***	2.0 ± 1.0***
Fruits	1.3 ± 1.0***	2.1 ± 1.3***
Lacteal	3.0 ± 2.5	3.4 ± 1.8
Meats	0.7 ± 0.4	1.0 ± 0.5
Fish	0.4 ± 0.3***	1.0 ± 0.4***
Egg	0.5 ± 0.5	1.0 ± 0.7
Meats, fish, egg	1.6 ± 0.9**	2.0 ± 1.8**

** ($p < 0.01$) ***($p < 0.001$)

Conclusion : The lack of knowledge on the characteristics of a diet adapted for physically active people is emphasised, as well as a away among the real habits compared to the ideal theoretical one. These results emphasized the need of campaigns of nutritional education in groups of active young people.
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P07

Consumption of aliments in a group of diabetic and non-diabetic elderly Spanish people

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Objective : To evaluate the consumption of aliments in a group of diabetic and non-diabetic elderly people, in respect to the recommended intake according to a Mediterranean diet.
Materials and Methods : This study was made in a population of 183 institutionalized elderly individuals of the Region of Madrid, aged 63 or more, 50 of them had type 2 diabetes. A seven days weighed food record (including a weekend) was kept in order to monitor food intake, expressing the results in servings/day according the standard size servings and comparing with the recommended in "The correct nutrition in elderly people" (Requejo & Ortega, 1995).
Results : The group of diabetic elderly people have a higher consumption of cereals comparing with non-diabetic ($p<0.05$), mainly due to the consumption of bread ($p<0.05$), while diabetics have a lower intake of simple sugars ($p<0.001$). The consumption of dairy products, specifically of yoghurt, is superior in the diabetic group ($p<0.05$) as well as the consumption of eggs ($p<0.05$).

Consumption of aliments (servings/day) depending on diabetes (X±DS).

	Non diabetic		Daily serving intake		ANOVA2
	Men	*Women*	*Men*	*Women*	*DIABETES*
Cereals	3.26±0.77	2.89±0.86 *	3.67±0.86	2.58±0.90	*
Bread	1.56±0.64	1.39±0.54 º	1.90±0.89	***	*
Simple sugars	1.31±0.47	1.29±0.52	0.83±0.55	1.58±0.70	***
				0.60±0.53	
Vegetables and fruits	2.78±1.06	3.07±1.30	3.35±2.08	2.96±1.30	NS
Dairy products	2.01±0.64	2.07±0.61	2.28±0.65	2.29±0.77	NS
Yoghurt	0.44±0.38	0.42±0.33	0.56±0.37	0.61±0.47	*
Eggs	0.30±0.19	0.29±0.16	0.45±0.37	0.30±0.17	*

***p<0.001; *p<0.05; NS Non significative

Conclusions : The group of elderly studied have a food intake not adjusted completely to a Mediterranean diet, due to the consumption of cereals and dairy products lower than the recommended, although the diabetic group have a closer adequacy because of the higher consumption of these groups of aliments comparing with the non-diabetic group.

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Mediterranean diet scoring: theory and application to the portfolio eating plan

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Introduction : Assessing the relationship of health with overall diet rather than with single nutrients or foods has intuitive appeal. Traditional Mediterranean dietary patterns have
Been linked to less chronic disease and longer life expectancies. The Mediterranean diet score (MDS) is a study specific gradient of adherence to the traditional Greek-Mediterranean dietary pattern. MDS has been used to compare diets of elderly Danes, Greek and Anglo- Australians, and Chinese in four geographic regions – Hong Kong, rural China, Sydney Australia, and San Francisco. In this study MDS was applied to the portfolio eating plan (PEP), a plant food based diet that combines numerous heart healthy components and results in cholesterol and C-reactive protein lowering of up to 30%. Clinical trials have shown that this portfolio diet strategy enhanced the cholesterol lowering effect of a low saturated fat/cholesterol diet, equal to a starting dose of first generation statin drugs (1,2).

Methods : The PEP dietary score was calculated by comparing the daily intake records from 43 hyperlipidemic subjects to the mean intake used as cutoff criteria for respective food categories of the Mediterranean diet. The PEP diet is high in plant sterols, vegetable proteins, almonds, oats, barley, psyllium and vegetables like okra and eggplant.

Results : Scoring of the PEP (vegan, lacto-vegetarian and non-vegetarian formats) against the Mediterranean diet results in a score of 6 out of a possible score of 8.

Conclusions : Quantifying the Portfolio Eating Plan with MDS provides another confirmation of the health benefits of a predominantly plant based foods dietary strategy.

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P09

High-fat, high fruit and vegetable diets: associations with dietary energy density and weight status

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The Mediterranean diet is characterized, in part, by the consumption of health-promoting fats and fruits and vegetables (F&Vs). High-fat foods generally have a high energy density (ED, kcal/g), which may contribute to obesity. Conversely, F&Vs generally have a low ED. This study investigated relationships between a high-fat, high F&V diet, ED and weight status in a representative US sample (1994-96 CSFII). Adults (>19y) with two diet recalls who were not pregnant/lactating or dieting (n=7500) were included in the analyses. ED values excluded beverages. Individuals were stratified on fat intake (≤30% and >30% calories), then further stratified on F&V intake (<5, 5-9, >9 servings/d), excluding fried and dried F&Vs and juices. Within each fat category, higher intakes of F&Vs were associated with lower ED values. While the ED of the high-fat, high F&V diet (1.41 kcal/g) was greater than the ED of the low-fat, high F&V diet (1.29 kcal/g); it was less than the ED of most other diet patterns. The prevalence of obesity (BMI ≥ 30) within the high-fat, high F&V diet pattern (9%) was lower than the prevalence within the high-fat, medium F&V pattern (17%, p<.0019) and within the high-fat, low F&V pattern (18%, p<.0003); but was not statistically lower than the prevalence within the low-fat patterns. Diets characterized by a high fat and a high fruit and vegetable content do not necessarily have a high energy density. A high intake of F&Vs can lower the ED of higher fat diets. Support: CDC/ORISE, DK039177, DK059853

Trends and intake structure of calcium from dairy products in the population of youth aged 13-18

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Aim : Analysis of trends and intake structure of calcium from dairy products in the population of youth aged 13-18.

Materials and methods : The research was carried out in the year 2004 among 896 people (405 boys and 491 girls) inhibiting three different environments: country, town and city. The eating habits of 13 dairy products were assessed on the basis of the food intake frequency method, using the ADOS-Ca questionnaire. On the basis of the determined dairy products quantity and eating frequency during a week and also nutrient value tables the calcium intake in mg/day was calculated and compared to recommended daily intake (RDI). The differentiation of calcium intake in sex groups according to age was held using the variation method and features distribution was compared using the chi^2 test with $p \leq 0.05$.

Results : The analyzed boys, in the age groups from 13 to 18 years old, consumed similar amounts of calcium, i.e. about 1044mg (128% of the RDI). Among 38% of boys potential risk of calcium deficiencies i.e. <66.7% of the RDI was revealed. The main calcium sources, regardless of the boys' age groups, were such products as: milk (37% of calcium), yogurts (21% of calcium), hard cheese (18% of calcium) and ice-cream (9% of calcium). The mean calcium intake in girls' population amounted to 721mg (89% of the RDI). The calcium deficiencies risk (<66.7% of the RDI) was stated among 54% of girls. The highest RDI realization was revealed among girls aged 14 (175% of the RDI) and 13 (96% of the RDI), and the lowest among girls aged 18 (66% of the RDI) and 17 (77% of the RDI). The main calcium sources, similarly like in boys' group were: milk (33% of calcium), hard cheese (21% of calcium), yogurts (20% of calcium) and ice-cream (10% of calcium).

Summary : Among about the half of girls and boys the potential risk of calcium deficiencies was revealed, despite satisfactory mean intake. In the boys' group amount and intake structure were not connected with age. Girls consumed less calcium while getting older. In both age groups regardless of age the main calcium sources were: milk, hard cheese, yogurts and ice-creams.

P11

A nutrient density standard for vegetables and fruit: Nutrients per calorie and nutrients per unit cost

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Objectives : To develop a nutrient density standard for vegetables and fruit, defined as a ratio of the nutrient content of foods in relation to the energy they provide.
Design and procedures : Nutrient adequacy and nutrient density scores for individual foods were based on the foods' content of 16 key nutrients. We used a French national food composition database for 637 foods, including 129 vegetables and fruit, and mean national retail prices obtained from government sources and supermarket websites.
Methods : Relationships between nutrient adequacy (NAS) and nutrient density scores (NDS) for vegetables and fruit, their energy density (ED), and the nutrient to price ratio (NPR) were tested using linear regression.
Results : NAS values were calculated as the mean of percent daily values for 16 nutrients, based on 100g of food. The nutrient density score (NDS) was obtained by dividing the NAS by ED. The nutrient-to-price ratio (NPR) was obtained by dividing NAS by food price per 100g, edible portion. Energy density and nutrient density were inversely linked, confirming the popular belief that energy-dense foods tend to be nutrient-poor. In contrast, fruit and vegetables were nutrient-dense in relation to their low energy content. Although fresh produce can be an expensive source of energy, high NPR values showed that fruit and vegetables provided nutrients (as opposed to calories) at a reasonable cost.
Conclusions : The 2005 Dietary Guidelines recommended that consumer food choices be guided by a nutrient density standard. The desirable foods are those with a high nutrient-to-energy ratio. The present NDS approach permits the examination of the nutrient value of foods not only with respect to the energy they provide, but also with respect to their cost.

Nutritional profil and hematological parameters in Tunisian children

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Objectives : Iron deficiency in children is a clinical problem caused by inadequate intake of one or more nutritional elements and remains as one of the most important health problem in developing countries. The aim of this study is to determine the relationship between alimentary diet, body mass index (BMI) and haematological parameters in iron deficient children.
Design and methods : Among the children who came to the Polyclinic (CNSS) of Sfax for consultation, we studied twelve diagnosed with iron deficiency (average ± standard deviation = 17 ± 8 months) and twelve other of the same average were taken as controls . Body mass index (BMI) was estimated by the formula (body weight/ height x height (m^2)). Alimentary diet composition of the subjects was rated by their mothers. Blood samples were obtained from a forearm vein with needle technique for routine tests such as iron serum levels and haematological parameters. Red blood Cells (RBC), leukocytes (Leu), Hemoglobin (Hb), hematocrit (Ht), platelets (Pl) were determined.
Results : The results of the nutritional inquiry revealed that children have received an unbalanced alimentary diet quantitatively (irregular food intake) as well as qualitatively (the diet is based on the cow dairy products, cakes, and few vegetables and fruits). In fact, we have obtained in the iron deficient group lower serum iron levels than the control ones (34 ± 17 Vs 95 ± 30 µg/100ml). In iron deficient children, body mass index (BMI) was significantly correlated with serum iron levels (r = 0,604) and haematological parameters particularly hemoglobin.
Conclusion : Unbalanced alimentary diet affect iron serum levels and haematological parameters in Tunisian children.

P13

Evaluation of the phenolic content of olive oil at various stages of the milling process

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Olive oil, the end product of the milling process of mature olives is known to contain substantial amounts of phenolic antoioxidant compounds. These may contribute to the health promoting effects of the Mediterranean diet. However, the methods used to produce olive oil likely give rise to substantial losses of these substances. To evaluate the extent of this, a site visit to an olive mill in the south of France (Villeneuve-lez-Avignon; Proprieter- Gerard Bertaud) was arranged. Representative samples from all stages of the milling process were collected for analyses of the phenolic antioxidant content. Samples (10 g) from each of the milling steps were extracted with organic solvents using a Soxhlet apparatus. The extracts were fractionated by flash column chromatography on silica gel with increasing concentrations of dichloromethane in methanol. Major components in the fractions were purified by semi-preparative HPLC and subjected to a range of spectroscopic analyses (HPLC, LC-ESI-MS, GC-MS and NMR) to identify and quantitate the phenolic compounds. Major compounds identified and quantited include hydroxytyrosol, tyrosol, caffeic acid, p-coumaric acid, aglycone of ligstroside, aglycone of oleuropein glucoside, dialdehydic form of ligstroside aglycone lacking a carboxymethyl group, dialdehydic form of oleuropein glucoside aglycone lacking a carboxymethyl group, (+)-pinoresinol, (-)-epi-pinoresinol, (+)-1-acetoxypinoresinol, acteoside and luteolin plus the triterpenoids oleanolic acid and maslinic acid. Mature olives contain abundant amounts of phenolic compounds with antioxidant potential. However during the milling proces, due to their inherent water solubility a large proportion (> 50 %) are lost to the vegetation water. Considering the health promoting properties of olive oil, efforts are justified to improve the partition of these to the oil during the milling process.

Dietary diversity and school age child nutrition in North Western Morocco

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Dietary diversity is used alternatively for the assessment of diet quality and food security. Morocco is undergoing nutrition transition while still suffering from a heavy burden of many micronutrient deficiencies and stunting.

Objective: The aim of this work is to assess dietary diversity and its relationship with anaemia and stunting in school-age children in the province of Kenitra.

Subjects: Overall 263 pupils were administered a food frequency questionnaire (FFQ).

Settings: A health team evaluated the anthropometric status and blood haemoglobin levels. Dietary diversity was estimated by two indexes: a dietary diversity score (DDS) based on the number of food categories consumed over a week, and a weekly frequency index (WFI) which expresses the whole frequency of food intake.

Results: Both indices are significantly associated with stunting but not with anaemia. The risk of stunting is greater in rural areas when undesirables' foods (sweeties.) are excluded from the SDA index. Parent education level is associated to fruits with vegetables and dairy products frequency intakes. It seems that WFI express diversity more than DDS especially in rural areas.

Conclusion: Much more work is needed in this area to elaborate appropriate dietary guides. Nutrition programmes must be integrated in the school health programmes.

Key words: Dietary diversity, anaemia, Stunting and wasting, school age, Morocco

P15

Evaluation of Vitamin D Insufficiency and Its Influencing Factors in Reproductive Age Women in Tabriz

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Numerous studies in different countries have shown the high prevalence of vitamin D deficiency in Asian countries. The aim of this study was to evaluate the prevalence of vitamin D deficiency and its influencing factors in reproductive age women in Tabriz city. 252 reproductive age, 15-49 years, women of Tabriz city were randomly selected. Weight and height was measured and body mass index was calculated based on weight and height results. Serum levels of vitamin D, calcium, phosphor, and alkaline phosphatase were measured by commercially available kits. Prevalence of severe, moderate and mild Vitamin D deficiency was 15.1%, 15.5%and 33.7% respectively. 3.7% were underweight and 59.8% had different stage of obesity. Only 37.5% had BMI in normal range. There was a significant correlation between serum level of vitamin D and weight ($p<0.05$). Alkaline phosphatase was increased in 1.6%. There was a decreased level of calcium and phosphor 8.7% and 3.7% respectively. It was not considered any significant correlation between vitamin D status and calcium, phosphor and alkaline phosphatase. In conclusion, vitamin D deficiency is common in women of Tabriz city. Therefore, it is suggested that intervention food fortification, education and sun exposure are recommended for women's health promotion.

Meal patterns and obesity

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Swedish Nutrition Recommendations include guidelines for temporal distribution of energy intake over the day as well as eating frequency. However, the current evidence for health effects of meal patterns is sparse. The objective of this study was to describe the association between habitual meal pattern and obesity.

The study is based on data from the research programme INTERGENE. The study population consists of randomly selected women and men, aged 25-74 years, living in the Västra Götaland Region in Sweden. A total of 3602 participated. Participants with measured BMI≥30 were compared with other participants with respect to questionnaire data on habitual meal patterns (breakfast, lunch, night meal, meals outside home, cooked meals, meal frequency and portion size). Odds ratio (OR) with 95% confidence intervals was adjusted for age, sex and physical activity in logistic regression models.

Being obese was significantly associated with omitting breakfast, OR 1.49 (1.12-1.98), omitting lunch OR 1.30 (1.03-1.64) and eating at night OR 1.69 (1.16-2.47). Obesity was also related with larger self-reported portion sizes, with a 11% increased risk of being obese per unit increase in portion size on a scale of one to nine. Moreover, women who reported eating meals outside home were less likely to be obese compared to other women, although no corresponding relationship were observed for men. No significant associations were observed between obesity and meal frequency or consumption of cooked meals.

In summary, obese and non-obese individuals do not differ in their self-reported frequencies of consumed meals or cooked meals. However, the results indicate that obese men and women have a meal pattern shifted to later in the day as well as consuming significantly larger portions than the non-obese.

P17

Weight gain over ten years in over 6,000 adults from a Mediterranean population. The EPIC Florence study

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Background : Obesity is an important cause of morbidity and mortality. An increased prevalence of overweight and obesity has been reported in most developed countries.
Objective : An update of life-style information, weight and other anthropometric variables is in progress among 12,772 EPIC-Florence volunteers who were alive and not diagnosed with cancer at 31/12/2003, in order to evaluate temporal changes in weight and its correlates in healthy adults.
Methodology : Volunteers were asked to report their weight and to provide a waist and hip measure using a paper meter enclosed with the mail questionnaire. A random sample of the cohort have been invited to the EPIC office to be measured by trained personnel following the standard protocol adopted at enrolment to compare self-reported with measured data in a validation study. Self-reported measures at follow-up have been calibrated according to the validation study results, applying calibration regression models by gender.
Results : Calibrated anthropometric measurements are currently available for 6,425 volunteers (50.3%; mean age at enrolment: 51 years); 365 randomly sampled volunteers have been measured. After a mean follow-up of 9.9 years (range 5.7-12.1) the average age-adjusted weight gain was 2.4 kg (95% CI 2.1-2.7) among men and 2.7 (95%CI 2.6-2.9) among women. The prevalence of overweight (BMI 25.1-30.0) and obesity (BMI>30.0) increased respectively from 50.1% to 55.3% and from 10.3% to 14.7% in males and from 31.2% to 37.1 % and from 9.1% to 14.9% among females. Weight gain was larger among younger subjects (<50 years at enrolment) and among normal-weight subjects, in both genders. No differences were evident according to level of education.
Conclusions : The prevalence of overweight and obesity increased among this large sample of Italian healthy adults in a ten-year period. Dietary and life-style determinants of weight gain will be investigated in the frame of DiOGenes, a collaborative European FP6 project.

Intake of different food groups according to the presence of overweight/obesity in a group of schoolchildren from Madrid (Spain)

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Objective : To investigate the differences between food consumption habits and compliance with Mediterranean Diet, between normal weight (NW) and overweight/obesity (OW/O) schoolchildren of Madrid (Spain).

Methods : It has been studied a collective of 128 schoolchildren (7 to 10 years of age). Height and weight were measured and used to calculate BMI, that let us classify the children in OW/O and NW using Cole´s criteria (1). The dietetic study was carried using a prospective 'food record questionnaire' over 3 consecutive days and "precise individual weighing" for the meals carried out in the school dinning. Differences in dietary data between OW/O and NW subjects were confirmed by analysis of covariance, adjusting for the degree of under- or overestimation (2) of caloric intake.

Results : In both groups of this collective we observed a withdrawal from the recommended food portions for this age group. NW children had a lower daily consumption of meats ($p<0.05$) pre-cooked foods ($P<0.01$), and soft drinks ($P<0.05$) in comparison with OW/O (in g/day). The NW group consumed more servings/day of green-dark and yellow-orange vegetables ($P<0.05$).

Conclusion : In general we observed a withdrawal of the dietetic guidelines. However, the OW/O group presents a worse dietary profile, so this group should deserve mayor surveillance in their diet composition in order to try to make them healthier.

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Introduction : The understanding of the etiology of complex diseases will require exploration of gene – environment interaction. We present evidence for a diet – gene interaction influencing BMI and trigljcerides.

Methods : 201 unrelated patients with type 2 diabetes (118 man and 83 woman), aged 35-70 years were consecutively seen at the outpatient clinic of a health district of the province of Naples. Among others anthropometry and plasma lipids were measured. Habitual diet was assessed using a standardized, semi-quantitative, food frequency questionnaire. Participants were genotyped for Pro12Ala polymorphism: 180 patients (89.5%) were Pro/Pro, 20 (10%) were Pro/Ala and 1 (0.5%) was Ala/Ala. All analyses were performed comparing Pro homozygotes with Ala carriers (Pro/Ala + Ala/Ala).

Results : BMI, plasma lipid and nutrient intake were not significantly different between Ala carriers and non carries. Participants were stratified according to sex-specific tertiles of caloric intake and PPARγ polymorphism status. Four groups were thus identified : Pro homozygotes or Ala carriers with low (1 tertile) or high (2 + 3 tertiles) caloric intake. BMI was significantly lower in Ala carriers as compared to Pro homozygotes in the low caloric intake group, whereas the opposite was seen in the high caloric intake group (p= 0.683 for the effect of PPARγ ; p=0.022 for the effect of caloric intake ,p=0.039 for interaction; two way analysis of variance). A similar analysis was conducted stratifying patients for the polyunsaturated to saturated fat (P/S) ratio of the diet (tertiles 1 vs tertiles 2+3) and PPARγ genotype. Triglycerides were significantly higher in Ala carriers as compared to Pro homozygotes in the lower P/S ratio group. This was not the case in the upper tertiles (p=0.037 for the effect of PPARγ; p=0.149 for the effect of P/S ratio, p=0.023for interaction).

Conclusion : This study provides evidence of a diet-gene interaction at the PPARγ locus for a complex metabolic phenotype resembling the metabolic syndrome (i.e. overweight and hyperlipidemia).

Health Hunters : An intervention to prevent overweight and obesity in young high risk women

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Objective : The prevalence of obesity is increasing dramatically, and prevention is believed to be the only feasible public health strategy for dealing with the growing problem. However, relatively few prevention studies are published. The aim of the study was to develop and implement an obesity and weight gain prevention program targeted to a high risk group.
Method : 18-28 year old women with at least one severely obese parent were randomized to the intervention or control group of the "Health Hunters" program. During one year of follow up, the intervention group received an individualized behavioural program focusing on food choice, physical activity and other lifestyle factors. Anthropometric measures and fitness levels were measured at baseline and after one year. Self-reported changes in obesity-related behaviours were also assessed.
Results : Baseline examinations were conducted in 40 women, of whom 30 completed follow up examinations one year later. Pregnancy was the most common reason for failure to complete the study. Compared to the control group (which gained weight), the intervention group displayed significant improvements in body weight, BMI, waist circumference, waist hip ratio and self-reported physical activity. Further analysis was conducted relating all subjects' weight changes with different diet and fitness factors. Those who did lose weight decreased their energy percent dietary fat (both saturated and unsaturated) and increased their energy percent protein and fiber density while energy percent carbohydrate was unrelated to weight change. Moreover weight loss was significantly associated with an increasing VO2 max and more time spent on the treadmill.
Conclusion : The Health Hunters obesity prevention program is effective in high-risk young women with familial predisposition for obesity. An analysis of changes in diet and fitness in relation to concurrent weight changes point out energy percent protein and fiber intake and time spent on treadmill as the strongest "protective" associations.

P21

Energy and macronutrients intake differences between overweight and obesity young women

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Objective : Obesity is a priority health problem. The caloric profile imbalance that it is being producing in Spanish diet can contribute to its development. By this reason to evaluate the differences in energy and macronutrients intake based on the suffering of overweight (OW, BMI <27 kg/m^2),) or obesity (OB, BMI≥27 kg/m^2) in a group of young women is the aim of this study.

Methodology : 67 women (20-35 years) with BMI between 24-35 kg/m^2. A "food and drink record" was used to register all intakes (7 days). Energy and nutrient were calculated using Food Composition Tables and the results were compared with the marked nutricional objectives for the Spanish population (1).

Results : OW women had better carbohydrate/lipid ratio than OB women (Table 1). Energy provided by carbohydrates (ETC) were significantly greater in OW women. Furthermore elevated ETC was associated with obesity protection (RR: 0.9 [CI, 0.8 to 0.9]; P<0.05). Finally women with largest weight obtained lower proportions of their energy from carbohydrates (r=-0.2943) and subjects with the largest BMI obtained greater proportions of their energy from lipids (r=0.2923) and lower proportions of their energy from carbohydrates (r=-0.3347). An inverse relationship was also seen between BMI and the carbohydrate/lipid ratio (r=-0.3363).

Table 1. Energy and macronutrients intake and energy profile

	OW (n=30)	**OB (n=38)**
Energy (kJ/day)	9465±2287	9414±2257
Carbohydrates/ Lipids	2.11±0.68	1.79±0.39*
Protein (% Energy)	15.1±3.1	16.3±2.8
Lipids (% Energy)	43.4±6.9	45.5±4.8
Carbohydrates (% Energy)	38.8±7.2	35.5±4.5**

*p<0.05, **p<0.01,

Conclusion : Approximating the diet to the actual recommendations (by increasing the consumption of carbohydrate and diminishing consumption of lipid) could be an effective way to avoid obesity progression.

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Weight gain and other anthropometric measures in relation to incidence of cardiovascular disease, breast and colon cancer in a female Mediterranean population: Findings from the Progetto ATENA

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Women in the European Mediterranean countries are reported not to take full advantage from the declining in frequency rates of cardiovascular disease (CVD), detectable all over European and North-American countries. Moreover, breast and colon cancer have been increasing steadily. In surveys, an increasing trend in their body mass and central fat has been described, suggesting that this condition might be associated with the chronic disease morbidity and mortality rates. This relationship has been explored in the Progetto ATENA, a cohort of 5,062 women, aged 30-69 and recruited between 1993 and 1998, living in the metropolitan area of Naples, Southern Italy. At baseline weight, height, waist circumference (WC) were measured according to a standardised protocol; reported weight at age 20 was also collected. Lifestyle and clinical data were recorded.. A total of 110 fatal and non-fatal CVD and colon and breast cancer incident cases were accrued after an average follow-up of 8 years. Adjusting for age, education and physical activity level (PALs) hazard ratios and 95% confidence intervals were: a) for BMI: <25=1.00, ≥25-29.9 =1.36 (0.84-2.21), ≥30-34.9=1.50(0.83-2.68), ≥35=1.69(0.75-3.79); b) for WC (adjusting also for height): <88cm=1.00, ≥88-99=0.96(0.61-1.52), ≥100=1.80(1.02-3.18). Using the latter adjustment and a weight gain per year up to 0,5 Kg as reference, we found: weight gain 0.5-0.99 kg per year equal to 1.16(0.73-1.86), weight gain ≥1 kg per year 2.12(1.05-4.30).
Our results indicate that in a large Mediterranean female cohort weight gain (sustained by central adiposity) from age of 20 plays a major role in determining CVD and breast and colon cancer.

P23

Antioxidant status and diabetes risk in the SU.VI.MAX study - Association with baseline plasma levels and effect of antioxidant supplementation

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The objective of this study was 1) to describe the associations between baseline plasma antioxidant levels and the long-term risk of diabetes ; and 2) to assess the effect of a supplementation with a combination of antioxidant vitamins and trace elements, at nutritional doses, on this risk.

3,300 adults from the SU.VI.MAX (double-blind randomized primary prevention trial) were included..

Baseline mean fasting blood glucose (FBG) in the supplementation group was not statistically different compared to the placebo group. After 7.5 y of follow-up, mean fasting blood glucose in the supplementation group was not either different compared to the placebo group. Incident cases of diabetes during follow-up (defined as a FBG > 7.1 mmol/l and/or oral antidiabetic treatments) were not significantly different between the supplementation and the placebo groups.

However, compared to the subjects in the 1st tertile, those in the 2^{nd} and 3^{rd} tertiles of serum baseline levels of β-carotene, presented a lower risk of diabetes in age and sex-adjusted analyses: OR [95% CI]= 0.54 [0.32-0.89] and 0.18 [0.08-0.42] (p for trend <0.0001). We also performed multivariate analyses with further adjustment on smoking status, physical activity level, educational level, body mass index and intervention group (placebo/supplementation). Multivariate-adjusted risks were still significant: OR=0.70 [0.42-1.19] and 0.32 [0.14-0.73] (p for trend =0.02). No association could be shown with vitamins E and trace elements plasma levels with the long-term risk of diabetes.

We were unable to demonstrate any overall effect of a low dose antioxidant supplementation on fasting blood glucose levels or on the risk of diabetes after 7.5 years of follow-up. But we found an inverse association between baseline plasma levels of β-carotene and the risk of diabetes.

Varied vegetable intake is associated with improved lipids: a six-month dietary intervention with a Mediterranean-style diet in Type 2 diabetes.

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Objectives : To compare an *ad libitum* Mediterranean-style (MS) diet versus a high carbohydrate low fat (HCLF) diet on weight, glycaemic control and lipids in people with Type 2 diabetes.
Methodology : 8 men and 8 women have completed this on-going 6-month dietary study. Patients were randomised to a HCLF diet (total fat ≤ 30%E, carbohydrate > 50%E) or a MS diet (total fat ≤ 40%E, monounsaturated fat ≤ 20%E) that promoted > 5 serves of vegetables/day eaten with olive oil. Before and after diets, anthropometry, fasting lipids and HbA_{1c} were measured and patients completed a dietary questionnaire.
Results : Patients lost weight on the HCLF diet, otherwise between diet effects did not differ.
(Table)

	HCLF dieta (n=8)		MS dieta (n=8)	
	0 months	*6 months*	*0 months*	*6 months*
Weight (kg)	83.2 ± 17.3	79.7 ± 15.7[b]	87.9 ± 13.1	88.5±12.2[d]
Waist (cm)	105.0 ± 14.0	101.2±12.2[b]	102.8±5.4	102.4 ± 7.3
HbA_{1c} (%)	6.7 ± 0.9	6.4 ± 1.2	8.6 ± 2.6	7.8 ± 2.8
Cholesterol (mmol/L)	4.9 ± 1.0	4.9 ± 0.9	5.2 ± 1.3	4.7 ± 1.2
HDL chol (mmol/L)	1.3 ± 0.6	1.4 ± 0.5	1.2 ± 0.3	1.3 ± 0.4[c]
Triglyceride (mmol/L)	2.6 ± 1.9	2.4 ± 1.7	2.3 ± 1.6	1.9 ± 0.9

[a] Data are mean ± SD; [b]*P*=0.01 within HCLF diet, cP=0.06 within MS diet (Student's paired t-test); dP<0.05 between diet effect (Student's unpaired t-test).

Merging groups (n=16), revealed that a greater number of different vegetables eaten per day was associated with change in HDL-cholesterol (r = 0.548, *P*<0.05).
Conclusion : In this preliminary analysis, little difference was found in the effectiveness of HCLF and MS diets. Nevertheless, higher vegetable intake, a key feature of a Mediterranean-style diet, was associated with improved lipid profile.

P25

Histopathological studies of the hepatic tissue of the sand rat (*PSAMMOMYS obesus*) during diabetes development

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Introduction : Through the survey of a population of P.obesus (P.o) we showed that there is a direct relationship between a relatively high caloric diet (HCD), obesity, DS-2 and atherosclerosis. Another current expression of these illnesses is a serious alteration of the hepatocytes that induces a lot of liver diseases.

Objectives : This study is designed to evaluate the histopathology of the hepatic tissue of P.o in control (animals fed with the naturally occurring hypocaloric diet; halophile plants), and in animals in HCD.

Material and method : Our study concerned 62 P.o of the two sexes, classified into 2 groups, 24 Po were kept as 'witnesses' group and fed on halophile plants, the others and 10 Wistar were on an HCD program. The experimentation lasted 12 months. For the macromolecules and enzymes nine experimental studies have been achieved, 20 enzymatic activities and 5 molecular substances have been compared.

Results : At the obese P.o (60%), the glycogenic overcharge increases strongly, the basophily remains normal and the lipids abundant. Among the diabetics (40%), the glycogenesis comes with a steatosis at the NIDDM and by a total glycogenic depletion, a considerable overcharge in lipids and an important decrease in lipoproteins at the IDDM. The enzymatic modifications are deep : the phosphorylase and the UDPG-synthetase, active at the obese and the NIDDM, are absent at the IDDM for which we note a hyperactivity of some lysosomale enzymes.

Conclusion : The P.o develop an obesity and a diet-induced diabetes without previous hyperphagy. The liver (central organ in the regulation of carbohydrate metabolism) undergoes deep pathological modifications induced by the HCD. The histochemical reactions found are in perfect correlation with the analytic results and with the histo-enzymological modifications observed. These perturbations of the hepatic tissue are typical of the diabetic state and are similar to those observed in the human diabetes.

Impact of a Mediterranean type of diet on the metabolic syndrome

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Background : The metabolic syndrome is an important risk factor for diabetes mellitus and cardiovascular disease and mortality. During the 1990s, its prevalence in the Netherlands ranged from 3% in women of 20-39 years to at least 33% in men >55 years. It is expected that the rates will increase in the near future. Therefore prevention, through e.g. dietary measures, is warranted. In this respect the amount and type of fat in the diet deserves attention. Recently, an intervention study reported that a diet high in mono-unsaturated fatty acids (MUFA) such as from olive oil, increased insulin sensitivity in healthy subjects. However, additional beneficial effects can be expected from the Mediterranean diet as a whole.
Study objectives: Aim of our study is to investigate the impact of the Mediterranean type of diet, and especially the intake of MUFA, on markers of the metabolic syndrome in high-risk subjects.
Methods : We will perform an intervention study comparing the impact of three diets (Mediterranean, high fat in MUFA, high fat in saturated fatty acids) on aspects of the metabolic syndrome (primary outcome: fasting insulin).The intervention, including 60 subjects aged 40-65 years with moderate abdominal obesity, will start in 2007 and will last for a period of 8 weeks. Measurements of serum insulin concentration and other parameters will be carried out at week 2, 6, and 8.
Expected results : Our study will provide information on the role of MUFA and the expected beneficial impact of a Mediterranean type of diet on the metabolic syndrome.

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Effects of polysaturated and monosaturated fat diet on insulin action and sensitivity in cultured rat hepatocytes

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Introduction : Insulin resistance is a common phenomenon in obesity and Type 2 diabetes. Increased dietary fat intake will lead to impairment of insulin action. The aim of this study was to find out changing of insulin sensitivity in dependence of fat diet and possible direct action of the diet on the liver.
Methods : Male Wistar rats were fed ad libitum (3 weeks) with standard, high polyunsaturated fat diet (sunflower oil) and monounsaturated fat diet (olive oil). Hepatocytes were isolated by a collagenase perfusion technique and cultured for 24 h in M 199 serum-free medium. The glucose production and _-amino isobutyric acid (AIB) transport was measured.
Results : Hepatocytes isolated from rats on high polyunsaturated fat diet had an increase in basal and glucagon-stimulated glucose production and insulin had no effects. Insulin significantly decreased and normalized basal glucose production in the liver cells from rats on high monounsaturated fat diet. Insulin-stimulated AIB transport was significantly lower in hepatocytes cultured from rats on high polyunsaturated fat diet, but in hepatocytes from rats on high monounsaturated fat diet was significantly higher than in the control.
Conclusion : High polyunsaturated fat diet caused higher glucose production from the liver cells, decrease in insulin action and sensitivity and lead to insulin resistance. High monounsaturated fat diet increased insulin sensitivity in the hepatocytes.

Relationship between ADRB2 and UCP3 variants and risk of type 2 diabetes mellitus in a southern Italy population

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Introduction : Type 2 Diabetes Mellitus (T2DM) is a complex disease with genetic predisposition. Previous studies suggested that T2DM is related through obesity to deregulation of energy homeostasis. We studied DNA polymorphisms in genes encoding peripheral energy expenditure as _-Adrenoceptors (ADRB), Uncoupling proteins (UCP) and regulators of adipocyte growth and differentiation. Genes related to the risk of diabetes could interact in an epistatically way. Epistasis occurs when an allele of one gene influences the phenotypic effects of another gene.

Methods : We conducted an association study in a case-control population. Our population sample is composed by 500 subjects: 200 patients and 300 controls. T2DM group is composed by 82 females/118 males, (age range = 34-79 years, mean 54.6 years, SD 7.33). Controls are composed by 124 females/176 males (age range = 34-77 years, mean 54.2 years, SD 8.35). In this population there are 149 obese and 351 non-obese subjects. The single nucleotide polymorphisms (SNPs) characterized were ADBR1 Gly389Arg, Arg16Gly ADRB2, Gln27Glu ADRB2, G(-866)A UCP2, C(-55)T UCP3, Pro16Ala PPAR_ and Gly483Ser PGC1. We genotyped all subjects by SYBR green Realtime PCR. Age, sex, lifestyle (smoking, diet) have been considered in the analysis as influencing environmental factors. We analyzed data by using binary logistic regression (BLR) and multifactor dimensionality reduction (MDR). We stratified the whole population for BMI.

Results : We have found in the whole sample by BLR an association between age class, Arg16Gly ADRB2 and the disease risk (P = 0.007). After stratification, in the non-obese group, we found an additional association with UCP3 C(-55)T variant. Also in this case the association seems to be age-dependent. The influence of ADRB2 variant on the disease risk seems to be dependent on the UCP3 polymorphism. Subjects with the UCP3 CC genotype had an evident association between ADRB2 and the disease risk, whereas the UCP3 T-carrier subjects seem to not influence the disease risk.

Conclusion: We found that two genes implicated in the energy expenditure could be involved in the risk of T2DM, interacting in an epistatic way.

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Comparison Between Saturated And Monounsaturated Fatty Acid-Enriched Diets On Oxidative Status Of Patients With Type 2 Diabetes

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Type 2 diabetes is associated with coronary artery disease (CAD) and elevated levels of oxLDL. Postprandial lipemia, associated to an increased pro-oxidative status, has been recognized as a risk factor for atherosclerosis. On the basis of epidemiological data, the consumption of monounsaturated fatty acid (MUFA)-enriched diets has been related to a lower rate of CAD.

Aim of this study was to compare the effects of a saturated fat (SAFA)-diet and a MUFA-diet on LDL oxidability, TBARS production and LDL vitamin content in type 2 diabetic patients in the fasting and postprandial states. In a balanced, randomized, crossover design, twelve overweight men (53±8 y; BMI 30.2±1.6 Kg/m2) consumed 2 experimental diets for 2 consecutive 3-wk periods. The diets were iso-energetic and similar for macronutrient composition (49% carbohydrates, 35% fats, 16% proteins) but different as regard the type of fatty acids. One was enriched in SAFA (17% SAFA, 3% polyunsaturated fatty acids, 15% MUFA) and the other in MUFA (8% SAFA, 4% polyunsaturated fatty acids, 23% MUFA). In $CuSO_4$ oxidized LDL, lag-phase values, calculated by monitoring conjugated diene formation, were significantly lower after SAFA diet consumption with respect to MUFA diet, both in fasting (65.0±2.2 vs 74.7+4.6 min, $p<0.05$) and postprandial states (60,7+2.2 vs 70.9+4.0, $p< 0.05$). In postprandial state, TBARS production was significantly higher after SAFA than MUFA consumption (69.3+5.2 vs 49.8+4.8 nmol/mg of LDL protein, $p<0.001$). In fasting state, LDL _-Tocopherol value was similar with both the diets. On the contrary, after SAFA diet, the postprandial content was significantly lower respect to the fasting one (1.93±0.10 vs 1.58±0.11 mg/mmol LDL cholesterol, $p<0.05$), while no changes were observed with MUFA diet. In conclusion, when a MUFA-enriched diet was consumed, LDL appeared more resistant against oxidation, mainly in postprandial state, probably because of the high A-tocopherol content. Results provide evidence of a protective action exerted by MUFA against the pro-oxidative status associated with postprandial lipemia in type 2 diabetic patients.

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Involvement of abdominal obesity, sugar intake and physical inactivity in the occurrence of metabolic syndrome and diabetes in Moroccan women

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Objective : To examine the influences of body weight, physical activity and carbohydrate intake on metabolic syndrome and diabetes in Moroccan adult women.
Methods : Data were obtained on randomised samples of 249 urban women aged 15 and older, non-pregnant, living in Laayoune city of South Morocco and who visited the Public Health Centres during immunization campaign. The following data were collected: Body weight, height, circumferences of waist (WC) and hip, blood pressure, fasting plasma glucose (FPG), triglycerides, dietary intake and physical activity. Body mass index (BMI) and waist to hip ratio (WHR) were calculated.
Results : The overall prevalence of the metabolic syndrome and diabetes were 16.3% and 6.4%, respectively. These values increased with BMI, WC and WHR. Women with diabetes or metabolic syndrome tended to have higher intake of sucrose essentially coming from sweetened beverages. They also spent more time in tea consumption and in afternoon sleeping (sedentarity) and lower time in sport and walking activity.
Conclusion : The results suggest that central obesity, sugar intake and sedentarity are involved in the occurrence of metabolic syndrome and diabetes in Moroccan women. Decreasing sweetened beverage intake, decreasing time spent in tea consumption and in afternoon sleeping, and increasing walking activity might be effective as a step in reducing metabolic syndrome and diabetes.

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Comparison of oxidative stress status and carotenoid status in volunteers from five European countries

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Exposure to a high fruit and vegetable diet increases antioxidant concentrations in blood and body tissues and potentially protects against oxidative damage to cells and tissues. Within Europe there are differences in cardiovascular disease risk between countries and this might be related to dietary habits. As part of a European multicentre project, several studies were undertaken with the aim of testing whether the consumption of food rich in carotenoids reduces plasma oxidative damage. In the present study, we described the intake and status in carotenoid and the oxidative plasma parameters (SH, SOD, GPx, oxidative resistance of LDL) at baseline from five European regions with different fruit and vegetable intakes and reported rates of C.V.D. Eighty volunteers (forty males, forty females per center), age range 25-45 years, were recruited from France (FR), United Kingdom (UK) , republic of Ireland (IR) , the Netherlands (NL) and Spain (SP) and their oxidative status compared. The total carotenoid intake was not different between male and female in each centre, but it was significantly higher (18mg/d) in FR and significantly lower (10,5mg) in Spain than others participating countries. The main sources of β-carotene were carrots in the diets of the volunteers in all countries except Spain were spinach was of slightly greater importance. A large number of foods (n=25) contribute to dietary lutein intake in these European countries. The main dietary sources of lutein for UK and IR were peas (36% and 19%), broccoli (8%,16%) and eggs (8%,10%) respectively. The main source of lycopen and _-cryptoxanthin was tomatoes and oranges respectively in all participating countries. Serum concentration of _-carotene was highest in the French volunteers whereas the carotenoids status in SP was one of the lowest from the participating countries. Lutein and zeaxanthin are highest in France and Spain. Mean female plasma ascorbic acid were higher in female than male counterparts but there were no significant differences between either male or female means between centres. Mean plasma thiol was lower in SP than either FR or UK but was similar to all others centres. The GSSG as a product of oxidized GSH was lower in SP and GPx activity was higher in SP than FR, suggesting difference in oxidative stress maybe in relation with carotenoids status. This result is in agreement with the mean urinary MDA/creatinine ratio which was lower in FR than SP. In turn the others countries were similar from FR (GB) or SP (IR &NL). In contrary the differences in carotenoids intake or status could not be related to ex vivo resistance of LDL (lag phase) or to red cells SOD cu-Zn, suggesting that carotenoids could plays an important role in protection of SH groups. In conclusion, these data on oxidative stress parameters may be considered as 'reference values' in serum of healthy, middle-aged subjects from five European countries. Considering ours results, a protective effects of the Mediterranean-like diet from carotenoids status could be explained by an protective effects of carotenoids on SH groups, but not on LDLoxidability. SP is a less consumer of total carotenoids among the European participating country, even if the lutein intake is higher with FR than others countries.

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Dietary patterns and coronary heart disease mortality

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The present study was initiated to study whether major dietary patterns predict coronary heart disease mortality. The study was based on the Finnish Mobile Clinic Health Examination Survey cohort and the study population comprised 5009 men and women, 35-69 years of age and free from heart disease. Dietary intake at baseline was estimated based on a 1-year dietary interview and two major dietary patterns were identified using factor analysis. A pattern labeled 'prudent' was characterized by higher consumption of fruits and vegetables, and a pattern labeled 'conservative' by consumption of butter, potatoes, and whole milk. The participants were followed for 26 years and during that time period a total of 621 participants died from coronary heart disease. Relative risks of coronary heart disease mortality (adjusted for age, sex, serum cholesterol, blood pressure, body mass index, smoking, diabetes, physical exercise, and energy intake) between the extreme quartiles of the pattern scores were 0.81 (95% confidence interval (CI) = 0.63-1.03; P for trend (P) = 0.01) for the prudent pattern, and 1.24 (CI = 0.97-1.58; P = 0.04) for the conservative pattern. The results are thus in line with the hypotheses that conservative dietary pattern is an independent risk factor and prudent dietary pattern a protective factor of coronary heart disease.

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Decline of cardiovascular disease mortality in Poland between 1991-2002 – contribution of changes in dietary habits

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Background : A decrease in mortality due to cardiovascular disease (CVD) has been recently documented in Poland. It is important to identify factors, which caused a reduction in CVD mortality, because the knowledge of this topic suggests further actions.
Aim : To analyse the relationship between changes in dietary habits and reduction in CVD mortality rates in Warsaw population.
Methods : CVD mortality data was obtained from The Central Statistical Office. Standardised CVD mortality rates were calculated for Warsaw population (aged 35-64) in each year from 1984 to 2002.
Individual dietary habits were assessed in 2571, 1397, 1485 and 836 randomly selected men and women from the same Warsaw population in years 1984, 1988, 1993 and 2001. Time-trends for energy and nutrients were calculated.
Results : Reduction in CVD mortality in analysed population commenced in 1991. The CVD mortality rates (age 35-64) decreased by 50% between 1991 and 2002 in both genders.
Over the 17 years of observation significant changes were noticed in the nutrition value of the average diet of Warsaw population. In 2001 in comparison to 1984 a decrease of men energy value by 18%, dietary cholesterol by 35%, animal fats (butter, lard) by 53% in both genders were found. The increase of consumption of vegetable fats (oil and soft margarine) by 330% in men and 250% in women was recorded. The above changes resulted in a significant reduction (25%) of atherogenicity level of diet as expressed by Keys score.
The improvement in dietary habits in Warsaw population resulted in a decrease in CVD mortality. These changes in diet preceded CVD mortality decrease by 5-7 years.
Conclusions : Changes in dietary patterns explain, at least in part, the mentioned reduction in CVD mortality recently observed in Warsaw population.

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Dietary habits and cardiovascular risk factors of the Warsaw population in years 1993-2001 – Pol-MONICA Project

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Introduction : Dietary factors are known to contribute to risk of widely prevalent chronic illnesses in Poland such as cardiovascular diseases.
Aim : To evaluate changes in dietary habits and selected cardiovascular risk factors of the Warsaw population in the 8-year period.
Methods : In years 1993 and 2001 dietary habits were assessed in 1485 and 836 randomly selected 35-64 year old men and women.
Results : Over the observation period substantial changes in food consumption pattern were noticed: the percentage of energy from fat decreased from 39,9% to 37,8% ($p<0,01$) in men and from 38,2% to 35,9% ($p<0,01$) in women, the percentage of energy from saturated fatty acids decreased from 14,0% to 12,4% ($p<0,01$) in men and from 13,5% to 11,9% ($p<0,01$) in women, the percentage from carbohydrates increased from 46,0% to 47,5% ($p<0,05$) and from 47,5% to 49,6% ($p<0,01$) and dietary fibre intake from 21,5 g to 22,8 g ($p<0,05$) and from 15,7 g to 17,5 g ($p<0,01$) respectively. In 2001 in comparison with 1993 intakes of vitamins C and B_2, calcium, magnesium, potassium and iron were significantly ($p<0,01$) higher in both genders, vitamin B_1 in men and E in women. At the same time decrease of population means total cholesterol and LDL-cholesterol (in men 13 mg/dl and respectively 12 mg/dl in women 9 mg/dl and 10 mg/dl) was noted
Conclusion : During the analysed period, changes in nutrient intake were substantial and indicate a change in direction towards the recommended preventive diet.

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Effect of Mediterranean vegetable soup ingestion on plasma vitamin C and antioxidant biomarkers in humans

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Consumption of fruits and vegetables is associated with a reduced risk of cardiovascular disease. "Gazpacho" is a Mediterranean vegetable soup constituted of tomato, cucumber, pepper, onion, garlic, olive oil, and wine vinegar.

The objective of this study was to assess the bioavailability and plasma levels of vitamin C from freshly made (FM) vegetable soup –"gazpacho"– and its impact on 8-*epi*PGF_{2a} (oxidative stress biomarker) and uric acid (cardiovascular risk factor) concentrations in a human population.

For this purpose six subjects consumed 500 mL of FM vegetable soup/day for 14 days. On the first day of the study, the subjects drank the vegetable soup in one dose (dose-response study), and on days 2-14 they consumed 250 mL in the morning and 250 mL in the afternoon (multiple-dose-response study). Blood was collected every hour for 6 h on the first day and again on days 7 and 14. All blood samples were analyzed for vitamin C, 8-*epi*PGF_{2a}, and uric acid.

The maximum increase in plasma vitamin C occurred 3 h postdose. Vitamin C remained significantly higher ($P \leq 0.05$) on days 7 and 14 of the intervention. Plasma 8-*epi*PGF_{2a} concentration was significantly lower ($P = 0.05$) at the end of the study. Plasma levels of vitamin C and 8-*epi*PGF_{2a} were inversely correlated ($r = -0.743$, $P = 0.0004$). In general, across individuals, uric acid concentration was lower when vitamin C was higher.

In conclusion, drinking two servings (500 mL) of FM vegetable soup ("gazpacho") daily increases plasma vitamin C and significantly decreases 8-*epi*PGF_{2a} concentrations in healthy humans, which provides new evidence for the healthy benefits of Mediterranean-style diet.

Vitamins C and E suppress stimulated peripheral blood mononuclear cells in vitro

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Several immunologic pathways and inflammation appear to be strongly involved in the development and progression of atherosclerosis. Increased neopterin concentrations and enhanced degradation of tryptophan are found in patients with coronary artery disease and higher concentrations of, e.g., neopterin predict adverse events in patients. Because both these immunobiochemical pathways are induced by interferon-_, the observations support a role of this Th1-type cytokine in atherogenesis. Consumption of food and beverages rich in antioxidants are considered to be able to reduce cardiovascular risk. Earlier we have found that wine, beer and green and black tea suppressed neopterin production and tryptophan degradation in human peripheral blood mononuclear cells (PBMC) stimulated with the mitogens phytohaemagglutinin (PHA) and concanavalin A (Con A) in vitro. In this study, we determined the influence of antioxidant vitamins C and E in the same experimental set-up. Compared to unstimulated cells, PHA and Con A increased production of neopterin and the degradation of tryptophan (all $p < 0.01$). Vitamins C (1–10 µM ascorbic acid) and E (2–20 µM _-tocopherylacetate) were found to counteract these effects in a dose-dependent fashion; significant reduction of neopterin formation as well as tryptophan degradation was observed ($p < 0.01$). Data demonstrate that vitamins C and E are able to slow-down and even to counteract activation cascades in stimulated PBMC as was reflected by reduced production of neopterin and degradation of tryptophan. Data suggest that anti-atherogenic effect of food rich in antioxidants may relate to an immunosuppressive behaviour which is achieved by antioxidant ingredients.

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Evaluation of nutritional and metabolic risk factors coexistence taking into consideration cardiovascular diseases

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The increasing global occurence of obesity and diabetes threatens the health breakdown. These constant trends suggest that obesity and diabetes of the type 2, and also the metabolic syndrome are going to be more and more important etiological factors of cardiovascular diseases. That is why there is a need of undertaking successive research of different types and also effort to define kinds and number od factors responsible for the development of the coronary disease. The research was carried out in the years 2003-2004 among 370 women in the menopause (aged 39-59) from Warmia-Masuria District. Body content of the examined women was characterized on the basis of the carried out anthropometric measurements, i.e. body mass (kg), body height (cm), four skinfolds thickness (mm), waist circumference (cm) and hips circumference (cm) and calculated on their basis indices: the BMI (kg/m2), fat mass in the body (%FM, %) and the WHR. The evaluation of the eating manner was made using the individual 24-hour recall method, repeated 7 times, made in irregular terms of time. The consumption of chosen nutrients, anthropometric and biochemic parameters of women were evaluated so as to specify the heart-vessels diseases risk. The main components method with the normalized varimax rotation was used to separate the main factors including those parameters that coexist and characterize the body content and metabolic profile (21 output factors). The correlation coefficience p>=0,5 was agreed as the boundary value in the analysis. Calculations were made using the Statistica v.6.0 programme. In the analyzed women's group the coexistence of nutritional and biochemic risk factors of the coronary disease was stated. The separated profiles of that coexistence created parameters characterizing body fatness, metabolic profile, and were connected with the amount of eaten nutrients, which allows for an individual interventions dealing, fitted for the analyzed population's needs, to limit the unfavourable trends of vessels diseases.

Mediterranean diet has a beneficial effect on blood lipids in a normal Swedish population – the INTERGENE research program

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Objective : To study adherence to a Mediterranean diet in healthy individuals in a cohort in the west of Sweden, and to study the association to traditional risk factors for coronary heart disease (CHD).
Method : 3602 randomly selected individuals (1903 women and 1699 men), 25-75 years, attended the INTERGENE research program[1] including examination of blood lipids, blood glucose, blood pressure, body composition and ECG. They completed an extensive food-frequency questionnaire. Mediterranean diet was defined as

- Using olive oil in cooking and dressing
- Eating vegetables 2 times/day
- Eating fruit 1 time/day
- Eating fish or fish oil 1-2 times/week
- Fulfilling 3 of the criteria: Eating nuts 1-2 times/week, eating poultry 1-2 times/week, eating legumes 1-2 times/week, drinking wine 1-2 times week.

Results : 15% of the women and 9% of the men fulfilled the criteria for the Mediterranean diet. Women with the Mediterranean diet had lower s-triglycerides (1.10 mmol/L vs 1.25 mmol/L, p = 0.01) and higher s-HDL-cholesterol (1.76 mmol/L vs 1.71 mmol/L, p = 0.03). For the other risk factors for CHD, total s-cholesterol, p-glucose, blood pressure and Body Mass Index there were no significant differences between the groups. There were no corresponding differences among men. Currently smoking was seen in 12% in the Mediterranean diet group and 18% in the remainders.
Conclusion : 9-15% of the participants in the INTERGENE research program fulfilled the criteria for the Mediterranean diet, which seems to have a small but significant effect on two important factors associated with CHD.

[1] www.sahlgrenska.gu.se/intergene

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Dietary fiber intake and risk factors for cardiovascular disease in French adults from the SUVIMAX cohort

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Background : increased consumption of dietary fiber is widely recommended to maintain or improve health but knowledge is limited on the relation of dietary fiber sources with cardiovascular disease risk factors.
Objectives : we examined the relationship between intake of dietary fiber types or sources, and cardiovascular risk factors in a cohort of adult men and women.
Design : in a cross-sectional study of 2,532 men and 3,429 women, quintiles of fiber intake were determined for each gender from dietary records. Age- and multivariate controlled logistic models investigated odds ratios of abnormal markers for quintiles 2 to 5 of fiber intake compared with the lowest.
Results : Highest intakes of total dietary fiber and non-soluble dietary fiber were associated with a significant ($p<0.05$) decreased risk of elevated body mass index (BMI), waist-to-hip ratio, and blood pressure, elevated plasma ApoB, ApoB/ApoA1 ratio, cholesterol, triacylglycerol and homocysteine,. Soluble dietary fiber was less effective.. Fiber from cereals were associated with a lower BMI, blood pressure and homocysteine level, fiber from vegetables with lower blood pressure and homocysteine and fiber from fruit with lower blood pressure and waist-to-hip ratio. Fiber from dried fruit or nuts and seeds was associated with lower BMI, waist-to-hip ratio, fasting glucose and apoB levels. Fiber from pulses had no specific effect .
Conclusion : dietary fiber intake was inversely correlated in both sexes with several cardiovascular risk factors supporting their protective role on cardiovascular disease and recommendations for increased consumption.

Geographical influences on the association between adherence to the Mediterranean Diet and the Prevalence of Acute Coronary Syndromes, in Greece; the CARDIO2000 Study

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Objective : We evaluated the interaction between adherence to the Mediterranean diet and region of Greece on the likelihood of having acute coronary syndromes (ACS).
Methods : During 2000-2001, a random sample of 848 patients (61 _ 10 years) with their first coronary heart disease event, and 1078 frequency matched (by age-sex) controls with no cardiovascular disease in their medical history, from all the country, entered into the study. Among several factors, adherence to the Mediterranean diet was assessed by a diet – score that incorporated the inherent characteristics of this diet.
Results : The multi- adjusted analysis showed that a 10-unit increase in the diet score was associated with a 27% (95% CI 0.66 to 0.89) decrease of the odds of having ACS. Moreover, a highly significant interaction was observed between region and diet score ($p < 0.001$). The odds ratios varied from roughly 0.5 in Southern to 1.2 or more in Northern Greek regions (p for heterogeneity < 0.05). Differences in food patterns consumed did not explain the previous findings. In addition, when we stratified our analysis by rural and urban areas we found significant differences in the estimated odds ratios (p for interaction between diet score and area = 0.01), since a 10-unit increase in the diet score was associated with 22% (95% CI 0.63 to 0.96) lower odds in urban areas and 31% (95% CI 0.48 to 0.98) lower odds in rural areas.
Conclusion : Our findings underline the importance of the Mediterranean diet on the primary prevention of ACS. Moreover, we revealed a geographical variation in importance of this dietary pattern on coronary risk, independent from the composition of food patterns consumed and the presence of the common cardiovascular risk factors.

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Sociodemographic and dietary characteristics of persons with different self-rated health.

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The aim of the study was to describe differences in sociodemographic variables, cardiovascular disease risk factors, and dietary variables between persons with poor self-rated health and persons with good self-rated health.

In 2001 information about self-rated health, age, education level, marital status, employment status, smoking habits, anthropometric measures, blood pressure, lipids profile and food intake was determined in a representative sample of 658 men and 671 women aged 20-74 from Warsaw population.

Poor health was more common in women (45%) than in men (38%). In both genders the prevalence of poor health was higher in groups of higher age and lower in groups of higher education levels and physical activity. Men with poor self-rated health had higher triglicerides and glucose level, whereas women had higher body mass index than persons with good self-rated health. In both genders no differences were observed in systolic and diastolic blood pressure, cholesterol and LDL-cholesterol level between persons with poor and good self-rated health.

Men, who rated their health as poor consumed less carbohydrates, magnesium, vitamin B6 and vitamin C than men with good self-rated health. Women with poor self-rated health consumed less energy, protein, fats, calcium, magnesium, vitamin E, and had lower diet atherogenicity in comparison with women with good self-rated health.

Differences in food intake and cardiovascular disease risk factors between persons with normal and elevated homocysteine level

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Homocysteine (Hcy) is positively related to atherosclerotic vascular disease, and is of particular interest in the Polish population, where the prevalence of these diseases is relatively high.
In the frame of Pol-MONICA bis Project carried out in 2001, plasma homocysteine, folate and vitamin B12 levels, lipids profile and dietary habits were determined in a representative subsample of 617 men and 657 women aged 20-74 from urban and rural country regions. Food intake was assessed by 24-hour recall method. Mean (geometric) Hcy concentration was 11.0 micro mol/L in men and 9.5 micro mol/L in women. Elevated Hcy levels (Hcy≥12 micro mol/L) were seen in 32.6% of men and in 20.3% of women.
Persons with elevated homocysteine level compared to persons with normal Hcy level were older, more often with subjective poor health status and low physical activity, and had significantly lower plasma folate and vitamin B12 . No differences were found in body mass index, systolic and diastolic blood pressure, and lipids profile. Men with elevated Hcy level consumed significantly lower amount of grain products, meat and meat products, whereas women with elevated Hcy level consumed lower amount of dairy products, vegetables, fruit, added vegetable fat, and greater amount of alcohol than persons with normal Hcy level.
In multivariable logistic analysis the odds ratio of high Hcy level (Hcy greater than 12 micro mol/L) was modyfied by age, marital status, physical activity, BMI, plasma folate and vitamin B12 in men. In women it was modified by age, marital status, plasma folate and alcohol intake. Diet did not influence the odds ratio of high Hcy level in both genders.

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Effect of folic acid supplementation on plasma homocysteine levels in patients with coronary artery disease

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Objective : Elevated plasma homocysteine concentrations is recognized as a risk factor for coronary artery disease and are inversely related to plasma folate levels. Therefore, the present study was done to assess the effect of supplementation of the folic acid on homocysteine levels in patients with coronary artery disease (CAD).

Methods : A double-blind, placebo-controlled trial was conducted on 70 male patients aged 45-65 years with documented CAD. Patients were divided randomly into two groups which received respectively 1 mg folic acid or placebo tablets daily for 8 weeks. Before and after intervention period, fasting blood samples were taken for measurement of homocysteine and folate levels. The Student' s t and Paired – t tests were used for statistical analysis of data.

Results : After 8 weeks supplementation with folic acid, folate concentration significantly increased in the folic acid group (10/88 ng/ml vs. 5/39 ng/ml)($P< 0.001$). Increased rate of serum foliate was higher in patients with initial serum folate < 5 ng/ml than other groups (19/44 ng/ml vs. 13/94 ng/ml) ($P < 0.01$).

Although there was no significant change with placebo group, the mean plasma total homocysteine concentration after 8 weeks of supplementation with folic acid significantly decreased (29/50 µmol/L vs. 39/75 µmol/L) ($P < 0.001$). Decreased rate of plasma total homocysteine concentration was higher in patients with initial plasma total homocysteine > 30 µmol/L than other groups (15/56 µmol/L vs. 23/21 µmol/L) ($P < 0.002$).

Supplementation with folic acid normalized plasma total homocysteine levels (<15µmol/L) in 50 percent of hyperhomocysteinemic patients.

Conclusion : These findings suggest that daily administration of 1 mg folic acid effectively reduced plasma homocysteine concentration in CAD patients. Therefore, in CAD patients with high homocysteine levels supplementation with folic acid could be recommended.

The effects of medical nutrition therapy (MNT) on the blood lipid levels and nutrients intake in Korean hyperlipidemic patients

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Hyperlipidemia is one of the risk factors for coronary artery disease. The purpose of this study was to investigate medical nutritional therapy (MNT) lead to beneficial outcomes in mildly hyperlipidemic adults. From February to October, 2003, the 43 hyperlipidemic (23 men, 20 women) subjects (total cholesterol>200 mg/dl or triglyceride>150 mg/dl) admitted to K medical center were studied. Subjects were randomly divided into 2 groups; with MNT and without MNT for 12 weeks. Anthropometric measurements, blood chemical analysis including lipid levels and dietary assessment were carried out at the beginning and end of experiment. After the 12 weeks of MNT, the subjects had regular and balanced meal pattern. Consumption of foods high in cholesterol and saturated fat, salty foods, fried foods, and instant foods decreased significantly in all groups ($p<0.05$). Intake of energy and cholesterol also decreased. In conclusion, the MNT improved the dietary habits and moreover the decreased of blood lipid level.

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Dietary and life-style determinants of mammographic breast density: a prospective study in a Mediterranean population

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Background : High mammographic breast density (MBD) has been associated with increased breast cancer (BC) risk even after adjustment for established BC risk factors. Fewer studies have examined the influence of diet and other life style factors that, overall, might play a role in BC and could be more easily modifiable than factors as reproductive history.
Methodology : In the frame of a prospective study in Florence we identified 2,000 women with a mammographic examination (ME) taken five years after enrollment, when information on diet, life-style habits and anthropometry was collected. Available MEs were identified and retrieved (1,668/2000; 83%) and MBD has been assessed by two experienced readers according to Wolfe's classification and a semi-quantitative scale. Updated information on reproductive history and Hormone Replacement Therapy (HRT) have been collected to take in account short time changes in MBD. A case-control analysis has been carried out comparing women with high-MBD (P2+DY according to Wolfe's classification) and women with low-MBD (N1+P1).
Results : As expected high-MBD was inversely associated with increasing BMI, number of children and length of breast feeding, while it was directly associated with high educational level and pre-menopausal status. A multivariate analysis, adjusted for non dietary factors, showed that high-MBD was inversely associated with increasing consumption of vegetables (p for trend=0.005) and olive oil (p for trend=0.04), and with increasing intakes of beta-carotene (p for trend=0.02) and vitamin C (p for trend=0.05). A positive association was evident for increasing consumption of wine (p for trend=0.01). These results were confirmed also in analyses taking into account HRT at the date of ME.
Conclusions : This prospective study, the first carried out in Mediterranean women, suggests that specific dietary components as vegetables and olive oil are associated with low-risk mammographic patterns, thus providing useful clues for planning preventive actions.

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Metabolic syndrome and breast cancer recurrences

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Objective : Several studies showed that hormonal, metabolic, and inflammatory mechanisms may affect cancer progression. We tested if metabolic syndrome could be a prognostic factor for breast cancer recurrences.

Methodology : We analysed, using the Cox proportional hazards model, the prognostic value of the metabolic syndrome in 110 women who participated into a dietary intervention trial aimed at reducing insulin and sex hormone levels in postmenopausal breast cancer patients (Berrino F. et al., *Int J Cancer*, 2005).

Results : At the beginning of the study 16 patients were affected by metabolic syndrome. They showed significantly higher levels of sex hormones, Insulin, and significantly lower levels of SHBG. The major determinant of prognosis was serum Testosterone. The hazard ratio of recurrence was 2.7 (95% CI 1.2-6.1) for the presence of metabolic syndrome and 7.8 (95% CI 2.7-22.9) for the upper tertile of testosterone distribution (0.5-0.93 ng/ml) compared to the lower tertile (0.16-0.33 ng/ml) after adjustment for disease stage and hormonal receptor status. The adjusted OR of recurrences among women with metabolic syndrome and testosterone levels higher than 0.40 ng/ml (median value) was 9.2 (95% CI 1.84-46.68) compared with women without metabolic syndrome and testosterone levels ≤ 0.40 ng/ml.

Conclusions : The results suggest that correcting the metabolic syndrome may favourably influence the prognosis for breast cancer justifying further studies on larger series of patients.

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Evidence of protective effect of dietary antioxidant on breast cancer risk in the prospective cohort of ORDET

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Despite the suggestion of a protective role of dietary antioxidant component in breast cancer prevention, the association between total dietary antioxidant capacity and risk of breast cancer has never been investigated. Taking advantage of the recently published data-base on total antioxidant capacity of Italian foods and beverages (Pellegrini N. 2003), integrated with 50 values for cereal and cereals products, pulses and nuts, the relation between dietary antioxidant capacity and breast cancer was evaluated among women participants to the ORDET prospective cohort study.
From 1987 to 1992, 10786 women volunteers were recruited among residents of Varese Province, Northern Italy, an area covered by a cancer registry. A semiquantitative self-administered food questionnaire was completed by 9186 participants. Three different assays were used to evaluate the dietary total antioxidant capacity to take into account the wide variety and range of action of antioxidant compounds in actual food: Trolox equivalent antioxidant capacity (TEAC), total radical trapping antioxidant parameter (TRAP) and ferric reducing-antioxidant power (FRAP). After median follow up time of 11.5 yrs, 293 cases of invasive breast cancer were identified. Cox proportional hazards regression was used to adjust for major confounders to determine the effect of TEAC, TRAP and FRAP on breast cancer risk. High dietary level of the three antioxidant measures were found to have significant protective effect on breast cancer risk: adjusted hazard ratio (HR) for the high versus the low quintile of TEAC was 0.53 [95% confidence interval (CI) = 0.34-0.83)]. Figures for TRAP and FRAP were HR = 0.63 (CI = 0.41-0.99) and HR = 0.58 (CI = 0.37-0.90) respectively; interquartile trends were always significant. These findings indicate a consistent inverse association between total antioxidant capacity of diet and risk of breast cancer suggesting that a diet rich in antioxidants might protect against breast cancer.

Reduction of oxidative DNA damage in post-menopausal women by consumption of a high-phenol extra virgin olive oil: a randomized cross-over trial

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Background : Olive oil is the key ingredient of the so called *Mediterranean diet*. Extra-virgin olive oils, high in phenolic compounds with antioxidant properties, could be partly responsible for the lower mortality and incidence of cardiovascular diseases and, possibly, cancer in the Mediterranean region.
Objective : The present study aimed to measure oxidative DNA damage in healthy women consuming olive oils with different concentrations of natural phenols.
Methods : A randomized cross-over trial of high phenol extra-virgin olive oil (High-EVOO, 592 mg/kg of total phenols), versus low phenol extra-virgin olive oil (Low-EVOO, 147 mg/kg) was conducted in ten post-menopausal women in Florence. Subjects were asked to substitute all types of fat and oils habitually consumed with 50 g/day of the study oil for eight weeks in each period. Oxidative DNA damage was measured by the *comet assay* in plasma lymphocytes, collected at each of ten visits during the study period. The excretion of the olive oil phenols and selected metabolites in repeat twentyfour-hour urine samples was measured to evaluate compliance.
Results : Extra virgin olive oil is the most commonly consumed fat by the general population in Tuscany, and we observed a quite sustained excretion of hydroxytyrosol at the baseline (682 µg/day). In the intervention trial, urinary excretion of hydroxytyrosol and its metabolite homovanillyl alcohol were significantly increased during the consumption of High-EVOO (p= 0.01). The average of the four measurements of oxidative DNA damage during treatment with High-EVOO was lower than the average during the Low-EVOO treatment, resulting in a 30 % reduction in damage (p= 0.02). Despite the relatively small sample size, this study showed a reduction of DNA damage by consumption of an extra-virgin olive oil rich in phenols, particularly hydroxytyrosol. A larger trial is needed to confirm and expand these results.

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Dietary trans-fatty acids and risk of breast cancer: findings from ORDET Prospective Study

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The relation between dietary trans-fatty acids and breast cancer was evaluated in an Italian prospective study. Dietary trans-fatty acids have been recently reported as having a possible role on the carcinogenesis, although limited data are available testing this hypothesis in humans.
Women volunteers were recruited from residents in Varese Province, northern Italy, an area covered by a cancer registry. Participants completed a semiquantitative self-administered food questionnaire, and anthropometric and other data were collected systematically. Using published nutritional composition data on trans fatty acids [1, 2, 3], we evaluated the individual daily mean intake of trans-fatty acids. After median follow up time of 11.5 yrs, 293 cases of invasive breast cancer were identified. Multivariate Cox proportional model, with age as the time variable, provided the hazard ratio with 95% confidents intervals. In the ORDET study, dietary intake of trans-fatty acids was directly related with breast cancer risk, also taking into account major risk factors for this cancer site.

	HR (95% CI) for increasing quintiles					
	I	II	III	IV	V	P for trend
Model 1*	I	1.21(0.83-1.77)	1.22(0.82-1.82)	1.56(1.03-2.37)	1.94(1.21-3.12)	0.005
Model 2**	I	1.26(0.86-1.84)	1.31(0.86-1.98)	1.74(1.10-2.74)	2.34(1.32-4.14)	0.004
Model 3***	I	1.25(0.85-1.83)	1.28(0.85-1.92)	1.67(1.09-2.56)	2.16(1.31-3.57)	0.002

* adjusted by age at menarche, menopausal status, weight, height, education, smoking status, energy intake, oral contraceptive use and parity;** adjusted also for intake of saturated fatty acids; *** adjusted as model 1 plus dairy products.

These findings suggested an increased risk for breast cancer in women with a diet rich in trans-fatty acids.

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Raw broccoli increases DNA damage in colonocytes

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Cruciferous vegetables, comprised mainly of brassicas, contribute up to 10% of vegetable intake in Mediterranean countries. The consumption of such vegetables has been associated with a decreased risk of colon cancer (van Poppel *et al.* 1999). Previously, the consumption of raw broccoli was shown to protect against DNA damage in colonocytes, whereas homogenised and microwaved broccoli had no such effect (Ratcliffe *et al.* 1999; Ratcliffe *et al.* 2000). A dietary trial was conducted to compare the effect of raw and blanched/frozen broccoli consumption on DNA damage in colonocytes. Fifteen male Landrace X Large White pigs were divided into five age (79 ± 3 d) and weight (34.7 ± 3.9 kg) matched cohorts, each consisting of siblings to minimise the effect of genetic variation. Within each cohort, siblings were randomly assigned to one of three treatment groups (R, B and C). Each group received a standard, high quality, cereal-based diet (control). This was supplemented with 600 g/d of raw (Group R) or blanched/frozen (Group B) broccoli (*var.* Marathon). There was a significant increase in the number of DNA strand breaks as measured by the 'comet assay' in pigs consuming raw broccoli, whereas the blanched/frozen broccoli had no effect: Group R 329 (SD 45.6), Group B 289 (SD 56.7), Group C 289 (SD 70.1) (arbitrary units) ($P<0.05$). This finding was unexpected as previously raw broccoli (variety unknown) had been shown to be protective. A possible explanation is that different varieties of broccoli have different effects. The biological implication of an induction of DNA strand breaks is unclear, but normally reflects genotoxicity rather than chemoprotection. The effects of consuming raw broccoli require further investigation.

This work was supported by a grant from the World Cancer Research Fund.

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5-methoxypsoralen, a Compound Found in Produce, Causes Hepatotoxicity

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The psoralens 5-methoxypsoralen (5-MOP) and 8-methoxypsoralen (8-MOP) occur naturally in common fruit and vegetable crops. While lower concentrations of these compounds may have anticarcinogenic effect, levels found in produce are occasionally high enough to cause dermatitis in humans. These compounds are sometimes unknowingly bred into crop plants during programs aimed at selecting for resistance to pests. In addition, although they are carcinogenic, synthetic forms of 5-MOP and 8-MOP are widely used in skin photochemotherapy with UVA (PUVA) to treat disorders such as psoriasis. PUVA has been shown to cause cancer, reproductive toxicity, teratogenicity and even death in some cases. Despite the vast literature on psoralens, studies on their effects on liver cancer and on growth and reproduction in mammalians are limited. We report herein on the hepatotoxicity in C57BW mice from daily exposure for four weeks to varying dietary concentrations (0, 50, 250, and 1,000 ppm) of 5-MOP. The livers were removed and fixed by immersion in 10% neutral buffered formalin. Tissue slices were dehydrated in a graded series of ethanols and embedded in paraffin. Tissue sections were cut at 6 µm intervals and stained with hematoxylin and eosin for morphological examination. Exposure to the high doses of 5-MOP caused hypertrophy of centrolobular hepatocytes and increased the amount of amorphous eosinophilic cytoplasm present in livers of treated animals; these are clear signs of morphological liver alterations. Males showed more histological alteration than females. The findings demonstrate the importance of monitoring our dietary intake of psoralens and for determining the potential risk for liver cancer in humans who are exposed to therapeutic, cosmetic, dietary, or occupational psoralens. (Research supported by NIH/NIGMS grant # 2S06 GM008197-20 MPRC-B to MMD).

Modulation of Telomerase Gene Expression by Zinc in Bladder Cancer Patients

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Telomerase, a critical enzyme responsible for continuous cell growth, is repressed in most somatic cells and activated in approximately 85% of human cancer tissues. It is a useful cancer-cell detecting marker in some types of cancers in which almost all cases show telomerase activity. Role of zinc as a probably interfering microelement in telomerase activity in human bladder cancer is the main subject of this study. This study was a case-control and consisted of 33 voided urine samples. Telomerase activity was measured by TRAP assay. Serum zinc levels of patient and controls were measured by atomic absorption spectrophotometer. 17 (51%) of the 33 cancer patients revealed positive results for cytology, where as using TRAP assay telomerase was positive in all of cancer cases. Only 30% (3 of 10) of the Grade I tumors, 83.3% (5 of 6) of the Grade II tumors and 50% (9 of 18) of the Grade III tumors were diagnosed by cytology. The detection accuracy rates were statistically significant (100% for telomerase vs. 51% for cytology). The difference of RTA (Relative Telomerase Activity) values between Grade I, Grade II and III was not statistically significant. The difference of Serum zinc levels between case and control groups were significant (P=0.04). Zinc levels in the both affected genders had dominant decreases, besides this shift was mildly more significant (P=0.04) in the female patients. There was an inverse significant correlation between the RTA and serum zinc level in the case group (r= -0.060, P= 0.48). In conclusion, it founded that zinc deficiency with increase of telomerase activity has a reverse relationship.

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Study of serum levels of Zn, Cu and Cu/Zn ratio in breast cancer patients

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Breast cancer is the most common one in women. In the progression and development of breast tumors combination of internal and external factors including trace elements are involved. The aim of this study was to evaluate and to compare serum levels of Zn, Cu and Cu/Zn ratio in breast cancer patients and controls. This study was a case-control, which composed of 50 women diagnosed with breast cancer and 50 normal individual. The range age of patients and controls was 30-50 yrs. Blood samples were obtained and sera were isolated immediately. The concentration of Zn and Cu were measured using atomic absorption spectroscopy. (AAS)

Mean levels of Zn and Cu in breast cancer patients were 0.015 and 0.023 mmol/L respectively. The mean concentrations of Zn and Cu in normal individual were 0.016 and 0.017 mmol/L, respectively. There was a trend association in patient and control regarding Zn concentration. There was a significant correlation between Cu levels of patient and control ($p<0.001$). In addition, the ration of Cu/Zn in breast cancer patient and controls were 1.52 and 1.12, respectively. This difference was statistically significant ($p<0.001$). In conclusion, it is speculated that changes of trace elements particularly Zn and Cu could have a critical role at the molecular level of the breast tumor cells.

The 'Israeli gender paradox': Higher Women Risk Vs 'Cancer shift' to the leading cause of death

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The unexpected Israeli low health status, compared to most Mediterranean countries, in spite of the 'good' diet- low in total and saturated fat, high in P:S fatty acid (FA) ratio, fruits and vegetables, was defined as the 'Israeli Paradox' and attributed to over consumption of n-6FA (12Kcal%). The recent 'Cancer shift' - 23.2%, over heart mortality - 22.3%, emphasizes the growing cancer risk. But Gender analysis reveals that only the women ranked unexpectedly low - 11th of 15 European countries in life expectancy, whereas men rank higher than most of them. This may suggests a 'Gender Paradox' of differential health results on the same diet, especially in cancer: Israeli women cancer death rates are 29% higher than heart deaths (men only by 7% more) and ranked much higher than men, 15^{th} vs 37^{th} in 44 European countries, compared to the rank for Ischemic Heart Disease (IHD), 34^{th} vs 38^{th} , and Cardio Vascular Disease (CVD) 42^{th} vs 44^{th}, respectively.

Arabic population, still holding more of the traditional Mediterranean diet and consume much less n-6 PUFA, have 3.3 times less cancer mortality, but faster growing rates. Their Diabetes and Heart mortality already surpassed the Jewish levels, especially in women. This may suggests that 'Israelization' of the diet, mostly exchanging the traditional olive oil for high n-6 oils and over consuming n-6 FA, affects women health more than men and is associated with cancer becoming the leading cause of death.

This is the first time that a gender is suggested as modulating factor of dietary effects on public health. Research evidences suggest significant Gender effect on Lipid Vs the protective effect of olive oil and low n-6:n-3 FA ratio. Further research may lead to differential approach to gender nutrition, especially as related to cancer epidemiology.

Sources of support- Tnuva food Industry Israel

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Consumption of vegetables and fruit in a sample of European children from 9 countries: The Pro Children cross-sectional survey

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As a part of the Pro Children research project, funded by EC DG RESEARCH, a validated instrument was developed for assessment of vegetable and fruit intakes of 11-year old children. A cross-sectional survey took place in all participating countries in 2003. The survey was performed in 9 European countries and included more than 13.000 children. It used nationally, and sometimes regionally representative samples of schools and classes. The instrument included a 24-hour recall component and a food frequency part and was completed in the class room. The number of compliers with the WHO population goal of 400 grams per day was determined, by ranking the subjects within each country according to intake level and identifying a cut-off level by taking subjects off from the lower end until the mean reached 400 grams. The subjects over the cut-off were identified as compliers. The first results show highly diverse intakes of vegetables and fruit in the participating countries. Boys generally consumed less vegetables and fruit than girls did in all countries, vegetable intake was lower than fruit intake. The highest intake was found in Portugal, the lowest in Iceland. Surprisingly low intakes of vegetables were found in Spain. Children's intakes were far from reaching the WHO population goal of 400 grams per day. The number of compliers ranged between countries from 20 to 56 % of the population of 11-year old children. Even though the WHO population goal does not explicitly outline how to estimate intakes for sub-groups of the population such as these 11-year old children, the same results were seen compared to national food-based dietary guidelines especially designed for children. There seems to be a need for targeted promotion programmes in all the participating countries. The Pro Children project will further elucidate determinants of intake in order to make promotion efforts more effective.

"5-a-day" in Germany – a small step toward Mediterranean diet and realisation problems in everyday life

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An increased supply of antioxidative vitamins, minerals, trace elements, fibre and secondary plant substances is associated with the Mediterranean diet and thereby a reduction in adipositas, arteriosclerosis, hypertension, hypercholesterolaemia, diabetes mellitus, gout, cancer or a combination of these diseases. Although the health beneficial effects of the Mediterranean diet have been proven, a simple transfer of this diet to countries with so called western diets is nearly impossible. The "5-a-day" campaign launched by the German Society of Nutrition in the year 2000, is a first small step towards adoption in Germany. However in reality, numerous difficulties are encountered in this approach and many of these remain unresolved. Within the framework of the HEILEI study 40 middle aged German women were encouraged to put "5-a-day" into practice over an eight week intervention period. Afterwards the women were asked whether it was generally possible to integrate "5-a-day" into their everyday life. Several problems and barriers of increasing vegetable and fruit consumption were elucidated. Only a few study participants experienced no problems. Whereas the majority of the study group had difficulties in realisation of "5-a-day". Barriers indicated by the study participants were: time and other requirements for meal preparations, limited availability of green salad, not overcooked vegetables and fresh fruit when eating out and difficulties in changing personal dietary habits. Encouragement of friends and the better availability of vegetables and fruit during the summer season were stated as helpful aspects to realize "5-a-day" in everyday life. Besides this, some women declared a "feel good factor" in terms of health aspects. Although "5-a-day" could be a first small step toward the Mediterranean diet in Germany, even this step will be hard to realize not only for the whole population but also for people who already have a knowledge of healthy diets.

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"Chance for the Young Heart" - Polish educational programme of prophylaxis of cardiovascular disorders for children and young people

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Numerous studies indicate that almost 50% of children at the age of 12 have at least one modifiable risk factor for atherosclerosis. Therefore it seems reasonable to undertake prophylactic activities based on the change in lifestyle among young generation of the European Union countries.

In Poland, within the framework of the National Programme for the Prevention and Treatment of Cardiovascular Disorders funded by the Ministry of Health, a pilot multi-centre educational programme for children and young people entitled "Chance for the Young Heart" – acronym: SMS – was implemented. The programme was intended for children in classes 5 – 6 of primary schools and young people in classes 1 and 2 of secondary schools. The objective of the programme was to reduce the incidence of environmental risk factors for cardiovascular disorders with underlying atherosclerosis. The programme is implemented in several layers:

1. through adequate and professional training for trainers – biology and physical education teachers – in cardiovascular physiology, nutrition, and assertiveness,
2. publication of educational materials in the form of 6 thematic brochures (available also in English) for use at work with pupils,
3. implementation of the multimedia programme for teachers as a teaching aid (programme available in English),
4. creation and maintenance of the website as an ongoing source of information for teachers and for the general public, creation of a consultation point for teachers in the form of consultants on phone and e-mail duty.

Preliminary findings showed, for example, that 4400 pupils in classes 5 and 6 of primary schools (on average 96% participation) and 8295 pupils in classes 1 and 2 of secondary schools (on average 56% participation) actively participated in the programme. Participation was assessed by the number of pupils logged in on pages of the www.sms.edu.pl server. As demonstrated by evaluation of the data given by pupils so far, 11% of them permanently take drugs, 9% indicated the presence of cardiovascular disorders in their family, and 32% said one of their parents smoked cigarettes. Further evaluation of young people's knowledge of cardiovascular risk factors will take place in June after final completion of the programme.

Free participation in the Norwegian School Fruit programme: Increased fruit and vegetable intake gives decreased consumption of unhealthy snacks

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Purpose : It is hypothesised that fruit/vegetables and soda/candy/potato chips are competing snacks. The purpose of the present study is to report the effect of free participation in the Norwegian School Fruit Programme[1] on the consumption of unhealthy snacks.

Method : Nine intervention and 10 control schools were randomly selected within Hedmark County, Norway. All pupils at the intervention schools participated for free in the Norwegian School Fruit programme the whole school year 2001/02, and were thereby given a piece of fruit or a carrot every school-day. A total of 517 6th graders (84%) completed questionnaires in September 2001 (Baseline), May 2002 (Follow-up 1) and May 2003 (Follow-up 2). Unhealthy snacks consumption was measured by three food frequency questions (soda with sugar, candy, potato chips). The effect of the intervention was analysed by mixed model regression on follow-up scores, adjusted for baseline scores and gender.

Results : Significant effects of the intervention were observed at both follow-up surveys. At both surveys, intervention pupils consumed unhealthy snacks 0.7 times/week less than control pupils (adjusted mean values: 6.0 vs. 6.7, p=0.02 and 0.01 for follow-up 1 and follow-up 2 respectively). An interaction between parents educational level (college/university education or not) and the intervention was found, indicating that the intervention was effective in decreasing snacks intake of pupils with parents without college/university education only.

Conclusion : Increasing children's fruit and vegetable intake seem to have a superior bi-effect in decreased consumption of unhealthy snacks. The effect was only significant for pupils with parents without college/university education, contributing to decreasing social inequalities often seen in health and in food habits.

[1] The Norwegian School Fruit Programme, www.skolefrukt.no

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The effectiveness of 5-a-day advertisement at the point of sale in Germany

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Introduction: The five-a-day campaign was launched in Germany in May 2000. The German campaign uses different means to communicate the idea of 5-a-day to consumers including advertisement at the point of sale.

Objectives: This study seeks to evaluate the effectiveness of the five-a-day campaign at the point of sale, i.e., in the retail market. We analyze if the recognition of the five-a-day label can be increased on a sustainable basis and if consumers' fruits and vegetables consumption patterns are related to the recognition of the 5-a-day label.

Methods: The five-a-day campaign was heavily advertised in a local supermarket over a two week period in August/September 2004. To evaluate the effectiveness of this campaign, customers were questioned using a closed questionnaire before (N=199), during (N=201) and ten weeks after the campaign (N=152). The collected data were analyzed using ANOVA and multiple regression analysis.

Results: The recognition of the 5-a-day label was increased from 17% before the campaign to 45% during the campaign. Even ten weeks after the campaign the recognition remained high at 33%. We observe a positive relation between label recognition and fruit and vegetable consumption. At the end of the campaign more customers named "a lot or a sufficient amount of fruits and vegetables" as a rule for healthy eating.

Consumers classified as taste-oriented eat more fruits and vegetables than those classified as health-oriented or convenience-oriented. People who consider their consumption of fruits and vegetables as sufficient eat more often fruits and vegetables. Hence consumers who consume too little fruit and vegetables are aware of their insufficient consumption, an important precondition for changing behavior through the five-a-day campaign.

We conclude that advertisement campaigns at the point of sale can be effective in increasing the recognition of the five-a-day label and that this increase will most likely lead to higher fruit and vegetable consumption.

Comparative analysis of National School Fruit & Vegetable Schemes

- in Denmark, Norway, England, the Netherlands and the United States

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Background : Increasing fruit and vegetable intake is an important public health strategy in preventing Non-communicable diseases. This has led to the implementation of School Fruit and Vegetable Programmes in a number of countries. School Fruit and Vegetable Programmes target increasing Fruit and Vegetable consumption in school food environments by increasing the availability of and access to fruits and vegetables in schools. Such programmes may offer substantial improvements to traditional health education strategies leading to more effective changes in behaviour. Increased fruit and vegetable consumption in children and adolescents can optimize health gains later in life, if food habits are improved early in life.

This study has: systematically reviewed existing literature on interventions focussing on increased accessibility of and access to fruit and vegetables in school settings; described and compared National School Fruit and Vegetable Programmes in terms of ownership, funding, organisation and current policy frameworks; and examined decision making processes that underpin conceptual development and implementation of school fruit and vegetable programmes.

Methodology : Data on relevant intervention studies were gathered by literature search on PUBMED. Descriptive and process evaluations were provided by programme coordinators, and finally semi-structured qualitative interviews with stakeholders provided information on decision making processes in Norway, England and USA.

Results : Interventions that target environmental factors such as availability, access and price seem to be effective and cost-effective compared to multi-component interventions. Preliminary work examining School Fruit and Vegetable Programmes show comparable results. However, few evaluations have examined the School Fruit and Vegetable Programmes impact on long-term dietary habits or outcomes.

A closer look at School FV Programmes reveals interesting differences in delivery systems, ownership and funding that may help inform future programmes or give input to improving current ones. School Fruit Vegetable Programmes in the USA and England differ radically from existing school meal policy, because fruit and vegetables are offered universally free of charge regardless of economic status.

Results from qualitative interviews revealed that, it is not always solid evidence that is the driver underpinning School Fruit and Vegetable Programmes. Personal champions, intensive lobby work by industry and anecdotal evidence have played equally important role in expanding programmes. Although there is an increasing amount of evidence that such programmes can be effective in increasing fruit and vegetable intake, other weaker evidence-policy relationships i.e. as an anti-obesity strategy, may be more effective in gaining public acceptance and funding.

Conclusion : Newer notions of public health and food policy demand that policies and programmes are based on good solid evidence, however political expediency and public demands often lead to policy, which is not always based on evidence. School Fruit and Vegetable Programmes can perhaps best be described as programmes with good partial evidence in search of better evidence. More rigorous evaluation of outcomes is needed to create more solid evidence.

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Low cost diets : energy-dense, nutrient-poor

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The observed links between poverty and obesity may be explained by the low cost of energy-dense foods. Grains, added sugars and added fats are inexpensive sources of energy. However, energy-dense diets can be nutrient-poor. We examined links between energy density (MJ/kg), energy cost (Euros/10MJ) and nutrient content of both foods and diets in the French SUVIMAX study. To estimate the nutritional quality of foods and diets, a Nutrient Adequacy Score was developed. For foods, it was the sum of the 19 ratios of nutrient content in 100g of each individual food, relative to the daily value (DV) for that nutrient. A Nutrient Density Score was also calculated per 10MJ of each food. For total diets, the Nutrient Adequacy Score was calculated per day, separately for men and women, whereas the Nutrient Density Score was calculated for each diet per 10MJ energy intakes. Energy costs for 851 foods, adjusted for edible portion, were based on mean national food prices. Daily diet costs for 4,981 subjects were estimated by multiplying food prices by portion size and summing over all foods consumed by each person. For both foods and diets, energy density and energy cost were inversely linked, confirming that energy-dense diets cost less. Energy density and nutrient density were also inversely linked, showing that energy-rich foods and diets tended to be nutrient-poor. Finally, higher nutrient adequacy scores were associated with higher costs per 100g food or per day, after adjusting for energy intakes, age, gender, education, and activity in regression models. These analyses show that nutrient-rich foods and higher quality diets were associated with higher costs. Strategies for dietary change ought to include environmental and policy measures to make healthier diets affordable and accessible to all.

Generic campaign in The Netherlands: 'Feel great with fruit and vegetables' 2003-2006

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Fruit and vegetables are an important part of a healthy diet. In the Netherlands there has been a decline of 17% in vegetable consumption and a 16% decline in fruit consumption (since 1987/88). This trend have negative consequences for public health. The slogan '2 + 2'(200 grams of vegetables and 2 times fruit per day) has gained widespread familiarity in recent years. But knowing doesn't automatically mean eating it. The 'Feel great with fruit and vegetables' campaign focuses on the benefits that fruit and vegetables can provide in the short term. This approach appears to have the greatest appeal to young adults (between 20 and 35). TNO Quality of Life provided the scientific support for this campaign. Holland Produce Promotion – communication bureau for the Dutch produce sector - is consignor. The 'Feel great with fruit and vegetables' campaign will continue through 2006; it is funded in part by the EU.

Scientific support : TNO Quality of Life conducted a literature survey on the short-term health benefits of fruit and vegetables consumption. Besides, experts of TNO contributed to the composition of an overview of the state-of-the-art in this field. Nine potential health effects (see frame) and a number of nutrients were selected:

1. Maintenance/enhancement of the immune system
2. Good function/promotion of bowel movement
3. Promotion of satiety/help in keeping a healthy weight
4. Good for the skin
5. Maintenance/improvement of cognition
6. A rapid source of energy in relation to sports
7. Lowering of blood pressure
8. Good for bones
9. Good for vision

On the basis of the composed scientific state-of-the art the relationships of nutrients or vegetables and fruit as such with these nine potential health aspects were classified as: 1.The relationship can be underpinned, 2.The relationship is possible, 3.The relationship is not likely and 4.There is a scarcity of study data justifying a conclusion. On the basis of an evaluation of the strength of scientific evidence for the various relationships and an assessment what vegetable and fruit types are rich sources of the various nutrients, Holland Produce Promotion was able to select in a responsible manner the short-term health benefits that could be claimed in the campaign 'Feel great with fruit and vegetables'. By order of Holland Produce Promotion, an advertising agency made advertising texts on the basis of information collected by TNO Quality of Life. Subsequently, TNO has evaluated these texts on three aspects: compatibility with the state-of-the-art, the absence of misleading information and the absence of medical claims.

Campaign activities : Radio: an effective and efficient medium to reach the target group (young adults between 20 and 35).

Print: magazines are being used to bring the short term benefits to the reader's attention.

Internet:: the campaign site is widely published in the media campaign. The functional properties of fruit and vegetables are explained on the website. In addition, the site will focus on simple tips for eating more fruit and vegetables every day.

Direct mail: campaign posters and brochures are sent to intermediaries such as dieticians, doctors, (district) health authorities, hospitals, fitness centres etc.

Evaluation : The first evaluation indicates that the message is taking hold. The target group appreciates the campaign and intends to evaluate their own fruit and vegetable consumption more critically.

The campaign affects the attitude of young adults; they become more critical about their own eating habits, especially with respect to vegetables. Significantly more people realise that they don't always achieve the recommended consumption of 200 grams of vegetables and 2 times of fruit every day. So less people think they eat enough fruit and vegetables. And that is good news, especially because one of the problems in promoting fruit and vegetable consumption is that many people underestimate their own consumption of these products.

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