

Introduction

Lorelei DI SOGRA

Director of the 5 a Day Programme, National Cancer Institute, NIH, DHHS, Bethesda, USA

Welcome to this afternoon's session. This session will leap from the scientific evidence to health promotion and disease prevention actions taking place around the world. We will talk about what is happening in 5 different countries. We are talking about action: how do we take the science and move it into action to change and improve eating behaviour.

The subject of this afternoon's session will focus on ways and actions to increase fruit and vegetable consumption. As many of you know, we have 15 years of scientific literature telling us how important it is to increase our fruit and vegetable consumption. All populations around the world are eating many less fruits and

vegetables than they need for good health. Many countries have national nutritional policies that recommend 5 servings of fruits and vegetables a day or to double fruit and vegetable consumption. We also have the WHO recommendations, again promoting increased fruit and vegetable consumption.

This afternoon, we will look at 5 actions that are taking place to try to increase fruit and vegetable consumption.

Our first speaker is Laurent Damiens from France. He is the Director of Aprifel in France, which is the agency for research and information on fruit and vegetables.

Communication

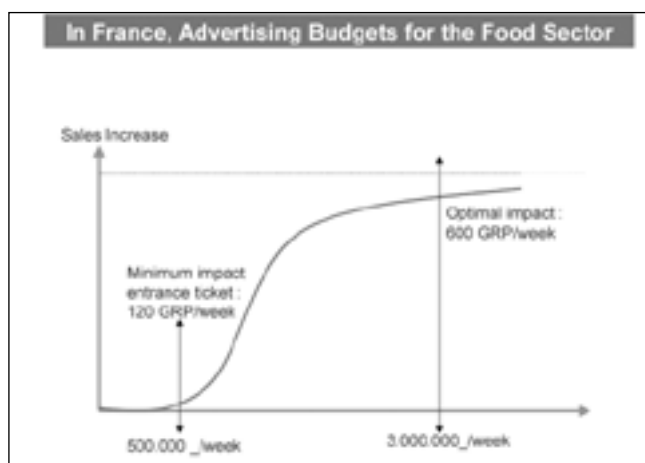
Laurent DAMIENS

Director of Aprifel, Agency for Research and Information on Fruit and Vegetables, Paris, France

Thank you. Advertising is a powerful tool to change food behaviour. Fruit and vegetable consumption has decreased in developed countries over the last 40 years. In France, the drop in fruit and vegetable consumption has averaged 1% per year. The reduction was dramatic in the 1970s and has been slightly decreasing since 1980. At the same time, the French population has increased by 13%. Therefore, fruit and vegetable consumption per capita has dropped significantly over the last 40 years to an average drop of 2% per year.

During the same period, consumption of industrialised foods such as soft drinks, sweets and chocolates, and dairy products, increased substantially. The two major increases in the last three decades are ice-creams, sweets, and soft drinks. The consumption of ice-creams and sweets has increased by a factor of 14, amounting to a 1 500% increase, and soft drink consumption, by a factor of 6, that is to say, a 700% increase.

One of the main reasons for these consumption increases is advertising. With advertising, the more you invest, the more you sell with the well-known AIDA model on the advertising response curve on sales. When you start to invest in advertising, it does not have any initial effect on sales until it reaches a minimum investment level – and only then you will have a significant improvement in your sales before it reaches an optimal level.

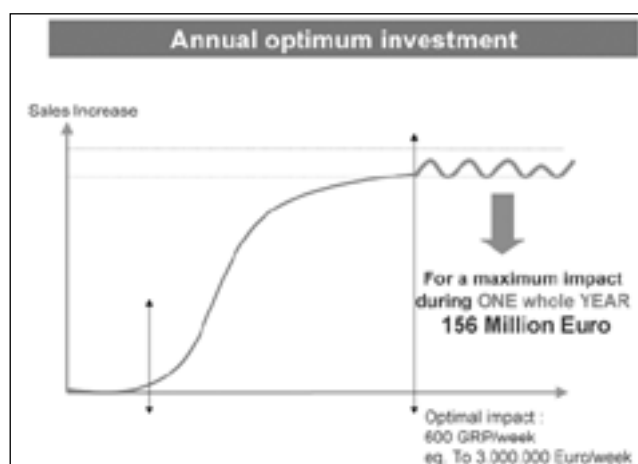


In advertising budgets for the food sector in France, the minimal impact entrance ticket is calculated to be 500 000 euros per week. So, if you invest under 500 000 euros per week it does not have any effect on your sales.

For the food sector in France, the optimum impact is calculated to be at a level of 3 million euros per week. If you calculate the optimum annual budget you need to invest in advertising for maximum impact for a whole year, you need to spend 156 million euros.

Who can afford to spend over 150 million euros each year? Certainly no company in the fruit and vegetable sector, that is for sure. However, the extremely profit-driven industry can. If you take the yoghurt industry, the chocolate industry, the biscuit or cheese industries, the coffee or tea industries, all those industries

can invest well over 150 million euros per year, which is the optimum advertising investment. If you take the two main investors in advertising in France: Danone spends 440 million euros a year, and Nestlé spends over 300 million euros. This is double the optimum investment for advertising for a whole year in France.



Do increasing advertisement investments go along with increased consumption? Little by little, the consumption increases have a considerable impact on food behaviour and on food behavioural changes. As scientific evidence points out, the need to increase fruit and vegetable consumption by investing in fruit and vegetable advertising for health issues has become an absolute necessity. However, the economics of the fruit and vegetable sector make this level of minimum investment impossible for any individual company, as the fruit and vegetable sector is made up of thousands of small companies – in France, we have over 127 million small units. Therefore, only public-private collective partnerships would make it possible.

This is what we are trying to achieve in France: a public-private partnership of fruit and vegetable advertising with the European Commission, the French Ministry of Agriculture and Food, and the whole-fruit and vegetable companies grouped together within our association. The total budget for this public-private partnership for advertising is 18 million euros for 3 years – funded 50% by the EU, 20% by the French Ministry of Agriculture and Food, and 30% by the fruit and vegetable companies.

Despite this partnership, we come to a quite limited budget of 6 million euros a year. Therefore, we have to know our target audience for advertising: to the 35 year olds and under, and more specifically those under 25 that we presume is the group with the lowest fruit and vegetable consumption level – what we used to call the 'new adults'. We can only afford to invest in 3 waves a year of 2 or 3-week campaigns each.

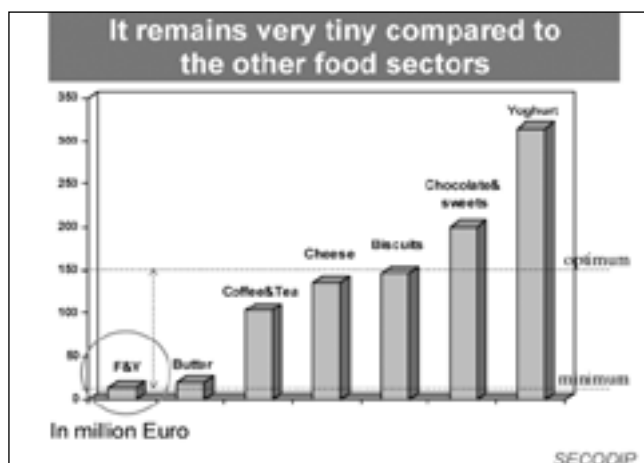
Here is the advertisement (DVD presentation).

These are not guidelines, as you can see. Nor is it education. The objective is to include fruit and vegetable consumption into modern lifestyle.

What impact has it had? The impact of our advertising on youth has been positive. We increased the consumption of fruit and vegetables

in the targeted youth group by 10% last year compared to the previous year, and by 11% in 2004 compared to 2003. For the rest of the population, however, the consumption slightly decreased.

The power of the media is such today that advertising is a powerful tool not only for industrialised food products, but also for fresh fruit and vegetables. However, with our budget level we can only work on a small restricted target. When we do the calculations, we would need 20 times this budget to have a substantial impact on the whole population. Our current budget is under 1% of the total for food advertising in France, but our fruit and vegetable advertising investment in France represents 0.86% of the whole-food sector advertising, which is very tiny compared to the other food sectors. As we are at the limit of the minimum impact, we have a little impact on consumption.



In conclusion, healthy foods like fruit and vegetables are totally isolated in an unbalanced food market for economic reasons. Advertising plays an essential part in this competitive disadvantage. Hence, government authorities have introduced measures to balance this situation to increase the fruit and vegetable advertising impact on consumer behaviour. My suggestions to increase the fruit and vegetable advertising impact are:

- 1) decrease the cost of advertising for fruit and vegetables, and
- 2) increase public financial support for fruit and vegetable advertising.

How could we decrease the cost of fresh fruit and vegetable advertising? In France, we could correct through a “grande cause” status or “general interest” status like the Max Avalor Café for fair trade, who have a 50% discount on advertising for the coffee; or through free public service announcements, as in Canada (our friends in Canada do not pay to advertise for fruit and vegetables); or indeed in the US, like the ‘Drink Milk’ campaign, where they did not have to pay anything because it was also free advertising.

The other possibility is to increase public financial support. Three ideas:

- we would like to reverse the dramatic downward trend in EU financing of fruit and vegetable advertising – it was 6 million euros last year for fruit and vegetable advertising for all the countries in Europe; it dropped to 4 million this year.
- we could create special sections for fruit and vegetable advertising at national level, based on the fact that the fruit and vegetable sector is in a disadvantaged economic position regarding advertising investment, which is why consuming fruit and vegetables has become a health issue.
- finally, in public-private partnerships for the fruit and vegetables advertisement the rate of public support could be up to 90%.

Promoting fruit & vegetables through schools - A European perspective

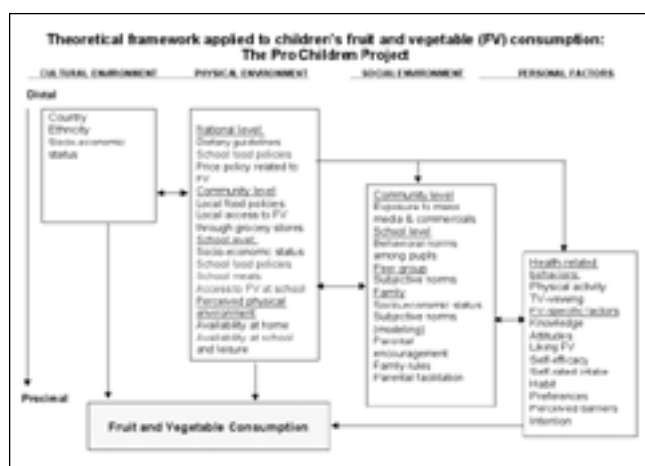
Knut-Inge KLEPP

Department of Nutrition, Faculty of Medicine, University of Oslo, Oslo, Norway

The focus of this talk is how we can promote increased fruit and vegetable consumption within schools across Europe. Our work could be labelled as action research and I will draw mainly on research results and experience from two large ongoing projects: the Pro-Children project, which is an EU-funded project taking place in 9 countries, from Iceland in the north to Portugal and Spain in the south; and also a large study conducted in Norway called the 'Fruit and Vegetables Make the Marks' study.

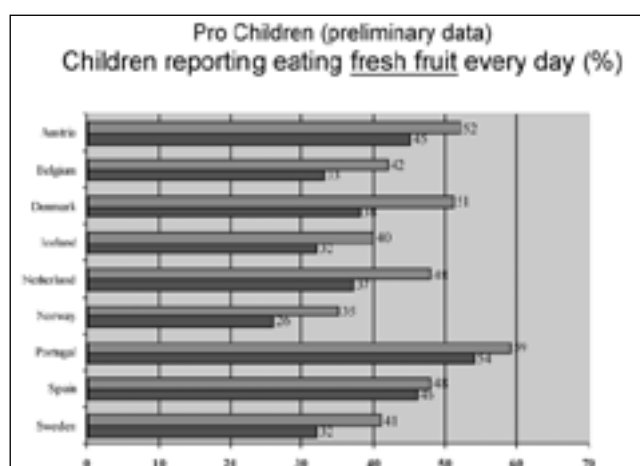
The main objectives of both of these studies have been to develop and test effective strategies to promote increased consumption of fruit and vegetables among schoolchildren and also their parents. In the Pro-Children study, we did surveys of national representative samples of pupils, and also their parents, in order to identify important determinants of fruit and vegetable consumption. In this study we also tested intervention programmes in three different settings, i.e. in Spain, the Netherlands and Norway.

A comprehensive model was used in the Pro-Children project in order to map out different determinants for fruit and vegetable intake (Figure 1). We labelled the cultural environment, looking at country, ethnicity, socio-economic status, the physical environment, social environment and also personal factors. Under the physical environment, we are collecting data on school food policies at the national level and also at the school level, looking to see what the guidelines and policies are, how the school meals are provided and what is the availability of fruit and vegetables. We are also assessing the availability of fruit and vegetables at the student level.



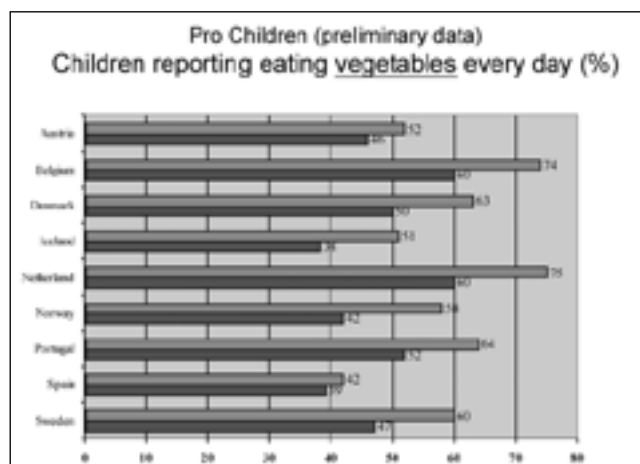
The Pro-Children intervention programme is a comprehensive programme where we are targeting the school, the family and the community. Within the school we have the classroom curriculum that has been implemented by the teacher. We focus on the school environment making fruits and vegetables more readily available. We have special school events and also special project committees that help promote the programme and facilitate its implementation within the schools. We also target the school meals. I will then in this presentation focus on what we are doing in terms of increasing the availability in the schools.

In October-November 2003, we conducted the national surveys. Here I present the proportion of children who say they eat fresh fruit at least once a day, so not meeting the guidelines but still eating about once a day. As can be seen from Figure 2, only about half of all the students say they eat fruit at least once a day. We did see some differences between the countries: the Portuguese children reported the highest frequency of eating fruit; and it was lowest in Norway. So here we see the north/south gradient that we know has existed historically in terms of fruit consumption in Europe.



For both fruits and vegetables, we see a clear gender difference: in all countries the girls report a higher consumption of fruit and also of vegetables.

When it came to vegetables, there was less of a north/south gradient and it was actually Spain which had the lowest proportion of children who reported eating vegetables every day, indicating that there are rapid changes taking place in some countries.



In the previous presentation it was mentioned that overall consumption in the developed countries has been going down. I should say that in the northern countries, such as Iceland and

Norway, fruit and vegetable consumption has substantially increased over the past few decades, with the overall vegetable consumption in Norway for example being doubled over the past 50 years.

We assessed availability at school level by asking the children whether they were able to buy or get free fruits and vegetables at school. We found that while there were differences across countries, overall the perceived availability is rather low, in that only small portions of students report that fruits are available on a daily basis at school. Austria had the highest proportion saying that they were easily available, and they were basically not available at all in the Netherlands.

We also saw large differences when it came to vegetables being available at school. Here it is Sweden that stands out with vegetables available every day as part of their free school meal, and the Netherlands again is at the bottom.

In the Pro-Children project, we tried to make vegetables more readily available. There is a school meal in Spain but the proportion of children that can participate varied quite a bit. However, we tried to increase fruits and vegetables being part of the school meals. Then, a special fruit break was introduced where all the children could get apples, oranges, bananas or tangerines. This was provided free by local distributors to start with but was subsequently taken over by the parents, and this program was continued throughout the school year. A large proportion of teachers and students reported this to be a positive experience.

In the Netherlands there is no organised school meal and pupils usually do not eat at school. We introduced a fruit break and all intervention schools received free fruit or vegetables once a week delivered by local retailers.

Some schools introduced special fruit breaks, other pupils ate the fruit and vegetable during their usual breaks, and some were even allowed to take it home with them – which was not our intention, but that was how it was implemented. Both teachers and children reported enjoying these breaks and the main complaint was that there were too many apples and too little variation.

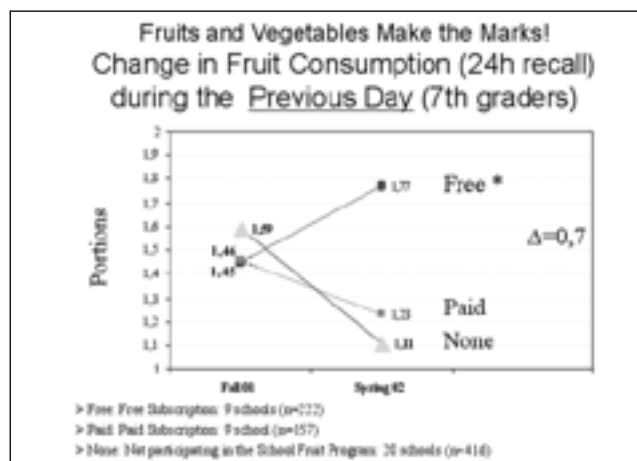
In Norway, we have had a school fruit programme in place on a pilot basis since the mid-1990s and it is now offered throughout the country. This is a subscription programme where parents pay about 2.50 Norwegian Kroner per day (~ 0.30 per day) for their child to receive an apple, pear, carrot, banana or orange at lunchtime.

There has been a large increase in the number of students participating in this, but while there are about 35% to 40% of schools participating, it tends to be the smaller schools which participate, and we are still only reaching about 10-15% of the total student population with this programme.

In the National programme we have tried to address some of the complaints and issues that have been raised. These include that there is a lack of variation and that schools do not have proper storage facilities. This has been addressed by introducing a rotating menu securing variation, providing storage facilities and boxes for easy distribution within the school, as well as better information to parents about the programme.

In the Fruit and Vegetable Make the Mark study, we were able to offer this programme for free to students in 9 schools in one of the counties. We saw a very clear effect of the programme. Figure 4 shows that there was a strong increase in the proportion

of foods eaten the previous day among those receiving the program for free. The students whose parents paid for the subscription also increased their consumption, but due to the low proportion of parents who participated, the impact on the school level was modest. Students whose parents did subscribe had a higher consumption level of fruit and vegetables even prior to the programme. For students at schools with no programme, we see a strong decrease, in part due to seasonal variation.



In this study, we have been able to follow the students for one more year, and we see that the effects obtained after the first year were sustained into the second year, even though the intervention stopped after the first year. There was a clear positive long-term effect one year later, with about 25% to 30% overall increase in consumption compared to the comparison group. We find this to be a very encouraging result.

I also want to point out that in Norway the National Nutrition Council's have been looking at ways for funding a free national fruit programme. In 2001, the sales tax on food was cut in half by the government. The council argued at the time that energy-dense, nutrient poor items (such as sugar-sweetened soft drinks) should be exempt from such a price reduction. Unfortunately, we were not listened to. In 2003, the sale of soft drinks in Norway just from grocery stores and petrol stations amounted to about 5.5 billion Norwegian Kroner. Thus, today the Government is losing about 500 million Norwegian Kroner just on sales tax on soft drinks. The estimated annual cost of a free school fruit programme for all school children is in comparison only about 400 million Norwegian Kroner.

In conclusion, the availability of fruit and vegetables at school varies considerably across Europe, and increasing the availability of fruits and vegetables for schoolchildren through subscription programmes and fruit breaks appear popular with pupils and teachers in very different settings.

The evaluation of the Norwegian school food programme demonstrates that providing free fruits and vegetables to children significantly increase their consumption, and this increase was sustained a year after the programme ended.

The paid school fruit programme, however, increased consumption among the subscribers, but the participation tended to be too low for it really to have an impact, and it could end up actually increasing the social inequalities seen in eating habits.

Our recommendation is that schoolchildren should be offered free fruits and vegetables during the school day as part of a healthy snack break.

Acknowledgement

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References

Bere E, Veierød MB, Klepp K-I: The Norwegian School Fruit Programme: evaluating paid vs. no-cost subscription. *Preventive Medicine*. 2005;41: 463-470.

Klepp K-I, Perez Rodrigo C, De Bourdeaudhuij I, Due P, Elmadfa I, Haraldsdóttir J, König J, Sjöström M, Thorsdottir I, Vaz de Almeida MD, Yngve A, Brug J. Promoting fruit and vegetable consumption among European schoolchildren: Rationale, conceptualization and design of the Pro Children project. *Annals of Nutrition & Metabolism*. 2005;49 (4): 212-220.

Pérez-Rodrigo C, Wind M, Hildonen C, Bjelland M, Aranceta J, Klepp K-I, Brug J. The Pro Children intervention: Applying the Intervention Mapping Protocol to develop a school-based fruit and vegetable promotion program. *Annals of Nutrition & Metabolism*. 2005; 49 (4): 267-277.

Yngve A, Wolf A, Poortvliet E, Elmadfa I, Brug J, Ehrenblad B, Franchini B, Haraldsdóttir J, Krølner R, Maes L, Perez Rodrigo C, Sjöström M, Thorsdottir I, Klepp K-I. Fruit and vegetable intake in a sample of 11-year-old children in 9 European countries: The Pro Children cross-sectional survey. *Annals of Nutrition & Metabolism*. 2005;49 (4): 236-245.

The fruit and vegetable snack program in the United States: A case study in policy development

Lorelei DI SOGRA

Director of the 5 a Day Programme, National Cancer Institute, NIH, DHHS, Bethesda, USA

Good afternoon. I am Lorelei DiSogra the Director of the 5 A Day programme at the National Cancer Institute in the United States.

I am going to talk to you about the Fruit and Vegetable Snack Programme in the United States, following up on what Professor Klepp has just mentioned. My purpose is to illustrate how results from research can lead to policy development. I'll be sharing one example from the United States and discussing how we intend to continue to build on this effort.

The Fruit and Vegetable Snack Programme in the US was started in 2002. It started with a vision from one of our Congressmen. About five years ago, all of us in 5 a Day programmes around the world (there are now more than 30 of these programmes) began to shift our attention and priority to environmental and policy changes that will increase fruit and vegetable consumption consistent with global and national health and nutrition recommendations.

In the United States we have a political champion for nutrition policy changes. At a national conference in the autumn 2001, Senator Harkin expressed his vision that every student should have a fresh fruit or vegetable snack every day at school. About 8 months later Senator Harkin took the opportunity to add legislative language authorizing a pilot fresh fruit and vegetable program for the 2002-2003 school year along with 6 million dollars of funding to the U.S. 2002 Farm Bill. The legislation specified the 4 states to implement the pilot fruit and vegetable snack program. In addition, the United States Department of Agriculture selected one Indian Tribal Organization to also participate in the pilot. Ninety-seven dollars per student was allocated for the pilot and 54 000 students participated in the fruit and vegetable snack program during the 2002/2003 school year. The fruit and vegetable snack was provided to students free and could not compete with school lunch, so in most cases it was offered in the morning.

For young children in elementary school, one serving of the fruit and vegetable snack was delivered to the classroom each day. Schools reported little or no waste and estimated that elementary school children increased their fruit and vegetable consumption by approximately 1-serving per day. In middle and high schools, a kiosk (large table) was set up in a central location in the school. The fruit and/or vegetable snack was put on the table and the table was refilled throughout the day. Students could come and take whatever they wanted. Many of the middle and high schools reported that students returned several times throughout the day and estimated that the program increased fruit and vegetable consumption by 2 to 3 servings a day. Increasing consumption by 2-3 servings per day is very significant, because it demonstrates that a school fruit and vegetable snack program can help close the gap between current fruit and vegetable consumption and national nutrition recommendations.

The funding for the pilot program was for only one year. Therefore, it was critical to ensure that the programme was implemented as effectively as possible in order to demonstrate

success and to serve as a building block for future funding and policy development.

In 2004 the fresh fruit and vegetable snack programme was expanded and received 9 million dollars of permanent funding. Although the 9 million dollars was very important, the fact that the funding was permanent was even more critical. The 2004 expansion provided funding for 8 states (25 schools/state) and 3 Indian Tribal Organisations. It is important to note that during the 2002 pilot, it was demonstrated that the snack programme could be successfully implemented for less money per student than had been appropriated therefore the 2004 legislation provided 60 dollars per student per year.

How did we go from a 1-year pilot to permanent funding? Hopefully, you can apply some of what worked in the US experience in your own countries. You need political champions and you need to cultivate them very well. You need cooperation between all the sectors in government – health, agriculture and education – so those ministries collaborate together. You need a diverse coalition of committed partners that will fight to increase funding and expand the programme. You need advocacy and lobbying. One recommendation I would make is to get out and start to advocate for what you know is going to make a difference in terms of public health. Turn national nutrition recommendations into policy actions; become an advocate in your own country, creating new political champions as you go along. In the US we started with a political champion from the Democratic Party, but for the last 5 years the Republican Party has controlled the White House and Congress, so you need to build support among all political parties in your country. You need to work aggressively to create those political champions, political will and ownership among all political parties. You need strategic leadership, must be willing to take risks, and market results relentlessly to everybody who will listen – the media, politicians and other advocates – and you need passion and commitment to build these programmes from the ground up.

From Vision... to Pilot ... to Policy

- Political Champion
- Collaboration: Health and Agriculture
- Diverse Coalition of Committed Partners
- Advocacy and Lobbying
- Creating New Political Champions, Building Political Will and Ownership
- Strategic Leadership and Risk Taking
- Market Results to Drive Political Will
- Passion and Commitment



I work for the National Cancer Institute in the Department of Health and Human Services, and we took it upon ourselves to

engage the Department of Agriculture in these our efforts. We created a formal relationship through a Memorandum of Understanding (MOU). That MOU says that the Department of Agriculture and the Department of Health will work together on efforts to increase fruit and vegetable consumption in the United States. Before the ink was dry, before the signatures were even on the Memorandum of Understanding (which is only about 4 pages long), we immediately started to put that MOU into operation for environmental change strategies.

Collaboration: Health & Agriculture

- 5 A Day Partners meet with political appointees at Department of Agriculture
- Health takes responsibility for building relationship with Agriculture. ... "Can we work together to increase F/V consumption?"
- Health & Agriculture establish official relationship thru Memorandum of Understanding (MOU)

Logos: NATIONAL CANCER INSTITUTE, 5-A-DAY

We focused immediately on what the Department of Agriculture could do in schools that would increase the availability and the accessibility of fruit and vegetables. We were very aggressive in our thinking about these issues and how we wanted to see them implemented. The funding for the snack programme in 2002 provided an excellent opportunity for the Department of Health and the Department of Agriculture to collaborate and we used the positive outcome of that collaboration as a model for successfully working together in the future.

Many organizations on the national level were driving this policy change. The National Cancer Institute, the Produce for Better Health Foundation, the Department of Agriculture, the United Fresh Fruit and Vegetable Association, School Nutrition Association, and the National Alliance for Nutrition and Physical Activity all played leadership roles.

Make sure that you give all credit to the political leaders and to your political champions – we, in public health do not need the credit; we need the behaviour change. We gave all the credit to our political leaders. Let it become their story. Let them go out and talk about the fruit and vegetable snack programme as an example of what they are doing to combat childhood obesity and to create healthier school environments.

One of the things I think is critically important is that we need to deliver results very quickly. Politicians work within a very short timeframe and so we need to deliver those results as quickly as possible. If we are really serious about behaviour change, we need to work on changing the school environment.

Building Political Will and Ownership

- Give credit to political champions
- Let it be their story... "We are improving children's eating habits to combat childhood obesity"
- Deliver results - Political champions need results they can see and talk about –quickly
- Make it easy for political champions to succeed at environmental change
- Translate "creating healthy school environments" into "increasing the availability of F/V in schools"
- Positive results build trust



When politicians see something, they believe it, so when we take them into schools and they see children eating more fruit and vegetables, as far as they are concerned the Fruit and Vegetable Snack programme is working.

An evaluation of the pilot programme was developed as a Report to Congress and the results of this Report have been aggressively marketed.

One of the other critically important things is to continually talk about how environmental changes are more effective, less expensive, less labour intensive and faster than traditional nutrition education.

We got results and positive changes in behaviour very quickly; one could say that at the end of week 1 of the Fruit and Vegetable Snack programme, children's fruit and vegetable consumption has increased!

Where are we going now? We have 9 million dollars in permanent funding, and have 8 states and 3 Indian Tribal Organisations participating. Our immediate policy goal is to secure appropriations from Congress to expand the fruit and vegetable snack programme to all 50 states (25 schools per state). This would cost approximately 42 million dollars. In this way, every legislator in our country will experience the benefits of having a fruit and vegetable programme in their state/district.

In the long term, our policy goal is to expand the programme so that every child in every school in every state will have a fruit and vegetable snack every day at their school. This is estimated to cost 4.5 billion dollars. If we are really concerned about improving children's health this is a small price to pay. Thank you.

Let me quickly introduce a dear colleague, Morten Meyer from the Danish Cancer Society. Morten is in charge of the 6 a Day programme in Denmark, which is based at the Danish Cancer Society. Morten, along with Laurent, is one of the leaders of efforts to increase fruit and vegetable consumption in Europe.

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

Morten Strunge MEYER

Danish Cancer Society / 6 A Day, Copenhagen, Denmark

It is a pleasure to be here and learn and network. I am pleased to have this opportunity to explain to you what I believe can be done in the workplace to increase the intake of fruit and vegetables. I am going to talk about 1) what is effective when we want to change people's behaviour in the workplace, 2) criteria for good interventions inspired by a recently published a WHO review, and 3) the Danish Worksite Fruit Programme.

Imagine the ideal intervention. It would be one that stayed in real life after the project period was over (sustainability). It would be nice if it was one that did not need millions of euros to do (cost-effectiveness). It would deliver results immediately – which would make it easy to sell, from a political point of view. From a more scientific point of view it should be possible to document changed behaviour – because that is what we want most.

So, how do we do that? Here is an effective solution: “Offer free and easy access to fruit and vegetables in the worksite”. If you put a bowl of fresh fruit close to people and they can take it for free, they will of course take and eat it. In worksites this should be done not just during breaks, but also while employees are working and during informal breaks.

What are the chances of implementing this? It all boils down to one question: How do we get employers to pay for this?

Some of the answers we get from interviewing the employees. We did research to estimate how excited workers are about getting the free fruit. 79% thinks free fruit is a valuable sign of appreciation from the employer. Lots of people think that it is delicious and healthy. The fact that the fruit is free is also a motivation factor, when less health items like candy, sodas and chips are not free. In fact some of the employees like the free fruit because they think it help them eat less candy and salty snacks.

The fruit and vegetable industry is of course also excited about this programme. They see the Worksite Fruit Programme as a new market. In Denmark there are now close to 50 new businesses that make a living from the simple idea and concept of having free fruit in the workplace. So you can count on strong support from the fruit and vegetable industry in running a Worksite Fruit Programme.

The role of Health NGO and government is then to inspire and convince employers to pay for the free fruit programme. How can that be done? To make such new and social norms is not an easy task, but evaluations and subsequent PR can be used to position the fruit as an attractive, modern and for the employer relatively cheap workers' benefit.

We have done a number of evaluations on workers satisfaction, intake and the dissemination of the programme. After each evaluation we go to the media and sell it as a news story and make sure that worksites on the programme are strongly exposed

as a good example in the media. This is a way of effectively introducing new social norms in a society.

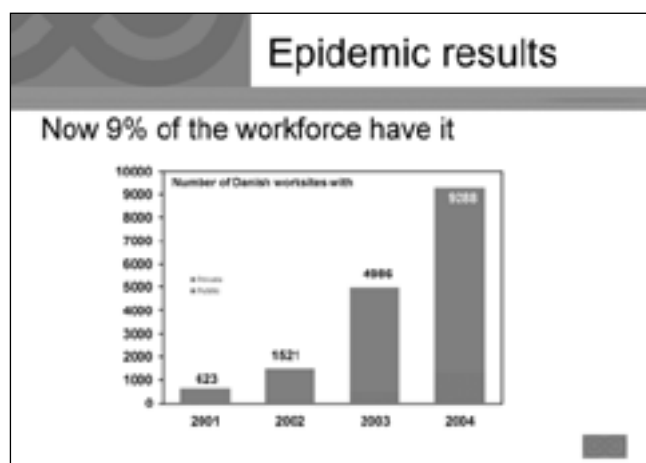
Free Fruit in the Worksites is probably our most successful intervention. In fact, the fruit and vegetable industry has now completely taken over and there is no longer a lot to do for the Danish Cancer Society and the Government. This is truly a self sustainable intervention; today, industry is doing the whole thing.

In the beginning we needed to evaluate if the free fruit is effective from a nutrition point of view. Do people change behaviour when the workplace fruit programme is introduced? Therefore we designed a study and here are the results: The fruit intake went up 0.7 servings per person per day on average. Equally important, the men halved their intake of snacks, cakes, ice-cream, liquorice, and so on.

Our challenge was and still is to influence the employers to pay for the fruit for their employees. So does such a study of increased intake make a big difference to employers? No, they could not care less. They need other kinds of evidence to legitimize this extra cost. We found that the free fruit is not just appreciated by for some of the workers; in fact all of them actually liked and eat the fruit. And eighty per cent expressed that they do not think this money could be spent in a better way and that it would be unimaginable if the fruit was taken away. That is the kind of research that is important to have in relation to convincing the employers.

Also we wanted to measure if the free fruit has an effect on people taking fewer days off sick? But this is almost impossible to measure. We choose to associate the two by letting employers know that what the cost to the company of having somebody stay home an extra day, is directly comparable to the value of providing free fruit for one employee for a whole year. We also argue that free fruit is a very cheap workers' benefit compared to anything else you can give to your staff, considering how well it is appreciated by the employees. So in a workplace where you need to attract staff and retain them, the free fruit proves to be a popular and important instrument. Also, for the employers, it is an important argument to say that this is perceived as a sign of appreciation. That last point is the one that has really been driving the program forward. There are a few other arguments that we have not been able to substantiated, amongst these are that productivity might improve as people do not go 'sugar cold' in the afternoon.

Figure 1 shows the dissemination of the Worksite Fruit Program in Denmark. We measured this in March 2004 and you can see the increase in the number of workplaces that provided fruit in the workplace. I am very pleased. A year ago almost 10 000 workplaces in Denmark provided free fruit to their employees. This is equal to approximately 9% of the Danish workforce. Before we started to promote the Worksite Fruit Program in 2000 this figure was very close to zero.



This programme is unique in the sense that traditionally you need to inform people and build awareness and intention to change behaviour, but in this programme we make an important shortcut. Introducing the Worksite Fruit Program will lead to changed behaviour overnight. Awareness, intentions and changed values you get for free after the behaviour is changed. Employees will start bragging about this new and wonderful programme. Bragging is one of the best kinds of marketing you can get for a programme.

This concludes my talk on the workplace fruit programmes. As one last thing I would like to draw your attention to a new WHO study that was published just two months ago. This is a study that compared the effectiveness of the different fruit and vegetable promotion interventions globally. The researchers found 3 500 different papers that were relevant. Only a little more than 300 were actually designed to increase fruit and vegetables, and

when they took out all studies with a less than perfect design, only 60 studies were left. If you look at these 60 studies, only 34 are actually dealing with adults. As you can see on Figure 2 worksites are one of the relatively well investigated arenas for increasing fruit and vegetable consumption.

34 adult studies

General population	4
Worksite	11
Health care setting	9
Churches	3
Low-income	5
Supermarket	2
Total	34

This research evaluated the many studies according to whether there was a control group, whether there was a long follow-up period etc. From this the researchers concluded that the most successful interventions are those targeted at people that are already at high risk of getting a disease and hence are highly motivated. One-to-one communication is also very effective. Comprehensive and community-wide interventions have also proven effective. But I believe an important aspect is missing in this new research. We must not forget to bring sustainability and cost effectiveness of interventions into the equation when evaluating worksite and all other interventions.

References

http://www.who.int/dietphysicalactivity/publications/f&v_promotion_effectiveness.pdf

The 5 colours of well-being: opportunities for consumers and producers

Fabrizio MARZANO

UNAPROA, National Union between the Organization of Fruit, Vegetables, Citrus and fruit in shell producers, Rome, Italy

Thank you. The producers of fruit and vegetable of Italy and Europe thank you of choosing Rome for this great event to promote the consumption of fruit and vegetables. I thank you as well as this beautiful city of Rome which, I hope, has welcomed you in the best possible way.

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 further extend 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, through 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, and the 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 the strong tie between diet and health and how people are increasingly aware of and sensitive to their well-being, achieved through 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, including:

- 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 together 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, 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 co-financing 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.

It is our intention to disseminate as much as possible “The 5 colours of well-being” message across the food supply chain, so that it can be well integrated into consumers’ lifestyle. Protecting our health through the consumption of fruit and vegetables improves our quality of life. We must maximise the opportunity for a better quality of life through a suitable diet and well-defined policy decisions.

Moreover, “The 5 colours of well-being” message is an opportunity for the producers themselves and their organizations. The examples reported from 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 an effective organization of the commercial relations through to the distribution phase.

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 healthy diet was stressed once again. This is but one of the latest events confirming internationally accepted theories. Despite widespread international consensus, the commitment of governments in this matter still appears too weak, considering the poor funding allocated to 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 cost effective endeavour in that, by protecting health, fruit and vegetables contribute to reducing health care expenses. Thus, taxation exemption on fruit and vegetables through the various stages leading up to the consumer, as well as harmonization, at least on the Community level – perhaps through a directive on the subject – could be a key element in achieving our objectives.

Discussion

Member of the audience - *Alain Perez - Journalist, France*

I am a journalist and my question is for Mr Damiens. As a French taxpayer, I do not understand why the state should subsidise the advertising campaign made by the fruit and vegetable industry. I live in the centre of Paris and my experience is that the price of fruit and vegetables has increased by 30% or 40% over the last 2 or 3 years. Why do you not just try to reduce the price of fruit and vegetables instead of asking for state aid?

Laurent DAMIENS

Nobody decides the price of fruit and vegetables. Compared to an industrialised product, where you would have a big company that decides the retail price at which the distributors should sell the product, in the fruit and vegetable economy, which is made up of 120 000 companies, the price of a product is led by the market at different levels – at the production level, the wholesale level, and then at the retail level. It is like a pure economy system where you have supply and demand, and so the market decides the price of the product. The food industry is made up of big capitalistic industries on the one hand, and on the other hand, for fish, meat and fruit and vegetables, we have another economic system where the price cannot be decided.

Regarding price increases over the last 2 or 3 years, the increases in France 2 years ago were mainly due to the fact that demand was quite high and we had problems with the weather: production was not high enough, which led to a difference in supply and demand, so prices increased a little. The economy was different last year because although the supply was alright and the agricultural price level was not very high, the demand was also there, so the supplier could fix the prices fairly high and they decided the price the consumer could bear. It is always a matter of competition: if you have a lot of products and if you have a lot of demand, the price will adjust. So no one can really decide the price.

Of course, politicians can decide the price because of the EU's agricultural policy, which for 40 years has made choices on the price of milk and beef, but which has also chosen not to do anything for the price of fruit and vegetables. Mechanisms do exist for prices but as individuals, no company can decide what the price should be – even the big supermarkets like Carrefour or Auchan have to adjust to the prices of their competitors – so it is a pure market economy for fruit and vegetables.

The question is related to the fact that some people with small budgets cannot afford fruit and vegetables, and I think that is more of a political issue.

Knut Inge KLEPP

To follow up on that, I think there is no doubt that the price of fruit and vegetables is a very important factor. The perception in Norway is that fruit and vegetables are very expensive. It is a correct perception. If you look at the price development, it is clear that over the past few years the increases have been much higher on fruit and vegetables than on other food items. Our policy in the National Council on Nutrition is very clear: the government needs to reduce the price of fruit and vegetables. They have a number of opportunities to do that, at least in Norway. One way would be to take away the sales tax completely on fruits and vegetables and increase it on food products whose consumption we all agree should be reduced, such as soft drinks. Things could also be done on things like import taxation, which could help reduce the cost of the products. We definitely support that kind of economic incentive.

Bill CLAY – *Chief of the Nutrition Programme Service, Food and Agricultural Organisation*

I would like to thank the speaker; it is really gratifying to see good examples of programmes that work and that can make a difference. I would like to correct one point: Mr Meyer referred to the WHO report that came out of the workshop; it is an FAO WHO report.

One of the things that comes through in each of the presentations is the need for effective partnerships, and one of the key elements in this – certainly from our side – is getting those concerned with health and those involved with the supply and marketing of food to work together. We recognise that it is important to bring these two sectors together and we are working very hard to try to do that. We would like to hear more examples of how we can do that, what we can do to try to get the different partners in these different areas to come together. It is a crucial element, but we are pleased to see that there are some successes we can point to and that we are committed to trying to make more of them.

Lorelei DI SOGRA

I am very happy that you are here because one of our political champions for the Fruit and Vegetable Snack programme for increasing fruit and vegetable consumption will be leading a delegation from the United States to FAO starting on Monday, so I think it would be a good opportunity for you to talk to him about the support from agriculture and how in the United States the Department of Agriculture, the Department of Health, the National Cancer Institute and the Produce for Better Health Foundation all work together in partnership on the Fruit and Vegetable Snack programme and on other efforts to increase fruit and vegetable consumption.

Jean SALES – *A French producer of vegetables and President of the Council of the National Office of Fruit and Vegetables (Conseil de direction de l'Office National des Fruits et Légumes)*

Fruits and vegetables are products, which, at the nutritional level contribute in nutrients more than a number of industrial foodstuffs. They should indeed be free! This exemption from payment is probably a very interesting scenario to go back to a balanced food. However, the problem of price is a central element if one wishes to promote a continuity of consumption, keeping in mind that the exemption from payment proposed by the public services will not be indefinite in time. However, this essential problem must be dealt with the entire food supply chain, from production to distribution, which implies costs of labour, inputs and transport. The development and implementation of social programs require a thorough thought process. I noticed the difficulty that Laurent DAMIENS had in expressing the variability of the prices of these products, although he did explain it very well. I doubt that the scientists present today and the journalists, who are not specialists, fully understood the nature of the mechanisms which govern prices. I am quite sure that a doubt remains on the manner of determining them. We must fully benefit from work such as yours since it is as important a subject as improving life expectancy and health of the population. From a personal standpoint, I must emphasise

that this work is beautifully done and remarkable. However, one should not forget to make statements about the importance of consumption does not necessarily lead to increased consumption. In the same way, the exemption from payment is probably not an end in itself. It is more necessary to work upstream with the food supply chain in order not to dismantle the national programs aiming at improving the provision of the products, the accessibility and the availability. In addition, if one wishes to 'demedicalise' the recommendations on food, we must work more on taste and on facilitating consumption of these products. As actors in distribution and trade, we put ourselves at the disposal of the scientists. However, do not forget us in the chain of events and in the development of this future which you recommend and to which we adhere. Thank you.

Morten MEYER

If I may make a brief reply, I would say that in the workplace fruit programme in Denmark, we do not see any trends or signs of this slowing down. This is still on a huge increase, so there are really no signs of this not being a sustainable intervention to have. Workplaces pay for this. I can see your concern if we were thinking about government-funded interventions, but this is privately funded and each workplace decides voluntarily to do this programme.

In fact, when you really focus on availability and accessibility issues on a national scale, you can see huge impacts way beyond what Laurent has been able to achieve with just commercial advertising. We have an increase of 38% on the national average intakes of fruits and vegetables, and a substantial part of that is actually due to the fact that we have been focusing on availability issues in schools and workplaces. We are making another strategic move of making it available, for free if possible, and managing the access.

This way is much cheaper and that is my proposal to the next distinguished speakers here. This way, people are actually doing what they want to do themselves and not for any other reasons; people take part purely because they think and believe and know that they can benefit.

These kinds of interventions are sustainable and I think it is very important not to be concerned about needing high prices to sell.

Member of the audience

My impression is that Mr Klepp hinted at what we could do when he talked about the tax on soft drinks in relation to the cost of the campaign on fruit and vegetables. We have another model in the fight against tobacco, where price increases have proved to be very successful. If on one hand we have foods that are beneficial for health (everybody agrees on fruits and vegetables and we could probably list others), and on the other hand foods that everyone could agree are detrimental (those containing above a certain level of fats, sugars, saturated fats, trans-fats, etc.), that could help the politicians to tax those health-detrimental products to help promote the health-beneficial products. We would then have a lowering of the consumption of bad products and at the same time an increase in the promotion of the goods ones. I think this could be acceptable. Of course, it would not be very pleasant for some industries, but that could encourage them to improve the quality of their own products if they did not want to fall into that taxation system.

Member of the audience

On the same point, we have heard about fiscal approaches on taxation and de-taxation, which seem to be naively good. In the particular context of the European Union, I wonder whether that would not hit straight into the wall of altering the competition, which is one of the EU's sacred principles.

Tobacco is different because it is just one product, but if you start to put taxes on food item A and de-tax item B, I suppose that is not feasible. I would like some illumination on that point.

Knut Inge KLEPP

I think there are a lot of sacred principles we have to challenge if we want to promote public health. In terms of taxes, all sorts of criteria are used all the time. In Norway, when the sales tax was reduced on food, food was defined as everything you put into your mouth except tobacco, alcohol and medication. I think you could easily come up with a clear set of other criteria that could then be used to promote the kind of food that we, from a public health point of view, want to increase and to reduce the others.

It is clearly a big challenge but I think we may have to make it clear what the different options are, what the health consequences are, and just keep pushing it. Use examples like the one I tried to use with soft drinks to visualise the amount of money that is being moved around in the public sector, and that this clearly has health consequences, even though the health concerns are not used when it is put in place in the first place.

Member of the audience - Ivan DRAGONI, Responsible of the school canteens of Milan

This is more a small contribution than a question.

I wanted to ask, how come in the program Pro Children, about which the Norwegian reporter told us, Italy has not been contemplated between the tested countries when the trend that there is in Italy is absolutely contrary to what is verified in the other countries. My name is Ivan Dragoni and I am responsible of the school canteens of Milan, where we produce eighty thousand meals per day for the children in primary schools and day nursery, therefore from the age of one year until fourteen. The school canteens in Italy are an obligatory service that is financed by the public institution and therefore by townships and in part paid by the parents, proportionally to their income. The menu must obligatorily involve vegetables and a fruit per day and not only a snack in the afternoon. The problem that we find is exactly the opposite: the offer is not free, but we observe a waste that for the fruits and vegetables approaches 70 to 80 % in the sense that when we distribute eighty thousand apples, normally seventy thousand come back refused and so do the vegetables to an even greater extent. This has led us to think that, all in all, merely offering fruit and vegetables is not enough, especially with the smaller children. There is also a need for actions to promote consumption, through classes at school, and also through the parents, and well-known speakers. Therefore we are studying a program of appraisal of cooking activity. It will actually start next week. Rather than tasting the flavour of several fruit and vegetables with appropriate cards, the children will come to school to be gathered around a table in order to peel a fruit, to prepare a fruit salad, to grate carrots and, even, to prepare small festivities for their parents. We believe that unfortunately the mere offer does not constitute, at least in our territory, a sufficient contribution to the change in the dietary habits. It has to be supported by a strong action from the school, towards the families and especially the children, but accompanied by definitely ludic activities.

Serge HERCBERG

Director INSERM and Vice-Chairman of the Strategic Committee in charge of the PNNS
(UMR Inserm/Inra/Cnam), ISTNA/CNAM, Paris, France

First, I would like to thank the Organizing Committee for its kind invitation and for giving me this opportunity to present data on the Nutrition and Health National Program (PNNS) set up in France in 2001.

I will summarize this Program and, according to the topic of the Round Table, I will highlight specific aspects demonstrating the role of politics, and especially of national public health authorities, in the carrying out of such a program.

The Nutrition and Health National Program was implemented in France under the aegis of the Ministry of Health. It is, in fact, the reflection of the French nutritional policy.

Nutritional policy is a concept which should be differentiated from a single specific action. In the first round table, we listened to some very exciting specific actions, proposed by different actors. All of these are perfectly relevant.

But each of them has a single specific objective, for example, to increase the consumption of fruits and vegetable in the overall population or in certain population groups.

A nutritional policy, by definition, implies a public health effect at the nationwide level. For instance, the PNNS (*Nutrition and Health National Program*) has as a general objective, the improvement of the state of health of the entire population, by intervening at the level of one of its major determinants, nutrition.

It is clear that no single action or measure, even if it is carried out under the best conditions, can be considered, in itself, as truly effective in achieving this global objective.

As a veritable public health program, the PNNS (*Nutrition and Health National Program*) includes a combination of synergistic and complementary actions, measures, rules, regulation and laws.

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

1. First, there is the choice of nutritional priority objectives, which can be achieved within a targeted period and which can be measured at the end of that period

Nine nutritional priority goals were initially determined for the 2001-2005 period, which was extended to 2008 within the framework of the French Public Health Law adopted in 2004.

Five of these concern diet (fruits and vegetable, calcium/vitamin D, lipids, carbohydrate/fibers and alcohol); one relates to physical activity (in the daily life) and three concern nutritional markers (cholesterol, blood pressure and obesity).

They are the same as those recommended by scientific authorities throughout the world. But the originality of this program lies in the fact that it provides clear quantification for each objectives defined for the specific period (2001-2008).

- For instance, concerning fruits and vegetable, the objective is to increase consumption of fruits and vegetables in order to reduce the number of 'low consumers' of fruits and vegetables (defined as someone consuming less than four portion of fruit and vegetables per day), by at least 25%;

- For physical activity, the quantifiable objective is to increase by at least 25% the number of people doing the equivalent of at least half an hour of fast walking per day.

9 nutritional priority goals (2001-2008)	
5 objective concern diet	
fruits and vegetables	25 % number of low consumers of fruits and vegetable
calcium / vitamin D	25% population with Ca intakes <RDA, 25% prevalence vit D deficiency
lipids	total fat intakes < 35% of daily energy intake, with 25 % in the population's consumption saturated fatty acids (< 10% of total fat intakes)
carbohydrates / fibers	> 50% of daily energy intakes, by 25% starch carbohydrates, 25% simple added sugars and 25% consumption of dietary fibre by 50%.
alcohol	alcohol intakes among consumers < 20g of pure alcohol/d
1 objective concern way of life	
physical activity in the daily life	25% in the number of people doing equivalent of at least 30 min fast walking per day
3 objectives concern nutritional markers	
cholesterol	mean blood cholesterol level in the adult population by 25%
blood pressure	systolic blood pressure in adults by 10 mm of mercury.
obesity	prevalence of overweight and obesity (BMI > 25 kg/m ²) in adults by 25% and to half the increase in the prevalence of obesity in children

Likewise, all objectives are precisely quantified. Therefore, they are measurable at the end of the targeted period.

These objectives, though ambitious, do not attempt to cover all of the nutritional problems affecting the overall French population. They are simply pragmatic targeted proposals.

These choices represent a politic decision validated by French Authorities based on strong scientific arguments.

Apart from these objectives aimed at the whole population, nine specific nutritional objectives aimed at specific populations (pregnant and lactating women, children and teenagers, the elderly, the underprivileged, etc.) and concerning specific nutrients (iron, calcium, vitamin D, folate,...), have been defined.

9 specific nutritional objectives
✓ To reduce iron deficiency during pregnancy
✓ To improve the folate status of women of reproductive age, particularly in those planning pregnancy
✓ To promote breastfeeding
✓ To improve iron, calcium and vitamin D status of children and adolescents
✓ To improve calcium and vitamin D status of older people
✓ To prevent, screen for and restrict malnutrition in older people
✓ To reduce the frequency of vitamin and mineral deficiencies and malnutrition among disadvantaged people
✓ To protect people following restrictive diets from vitamin and mineral deficiencies; take care of the nutritional problems of people with eating disorders
✓ To take the problem of food allergies into account

As a global policy, the Nutrition and Health National Program combines different strategies oriented towards communication, information, the nutritional and alimentary environment, food composition and food availability.

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

The program adheres to some fundamental principles including the notion of pleasure, conviviality and gastronomy; it takes a

positive approach oriented towards promoting protective factors. It is never oriented towards prohibition, and any inherent messages should be adapted to lifestyles. It relies on synergy, complementarity and coherence in all the actions it implements.

To succeed in attaining its goals, the Nutritional and Health policy had first to establish a clear, scientifically recognized, referential setting including:

- a logo (with the official colours of the French flag –blue, white, red- along with a smile as a reminder that health is perfectly compatible with pleasure!), designed to authenticate all action undertaken and managed in conformity with the nutritional objective of the PNNS.

- However, the key point of the national referential setting is the translation of Public Health objectives into practical reference guidelines which provide quantitative and qualitative information for daily food choice available to the general public.

These guidelines provide practical benchmarks for foods as they are purchased and consumed by the population. We are not talking here about nutrients, but we are talking about fruits, vegetables, bread, meat-fish-eggs and sweets. Details are provided for the quantities and types of foods: how many fruits and vegetable per day, which kinds ; how many dairy products and starchy foods, ...How much physical activity, etc...

Of course, it is not enough just to formulate quantitative and qualitative recommendations.

It is really important to adapt these recommendations and guidelines to all real life situations, and to show that they are attainable by most of individuals.

This is being done by means of the National Food Guides, which set guidelines available to all types of population. These guides provide advices to individuals whatever their lifestyle, economic levels or cultural background enabling them to adapt their behaviour in line with the recommendations, thereby adhering to protective factors without changing their way of life.

The advices and recommendations take into consideration the notions of pleasure, conviviality and gastronomy in daily food consumption; they are easy to use and never oriented towards forbidding certain foods.

More than three and half million copies of the National General Food guides have been distributed to the general public. Specially adapted versions of the National Food Guide have been developed for parents of children and adolescents and are in preparation for pregnant women and older people.

The messages are always adapted to the lifestyles. For that purpose, the Food Guides present different patterns (models) of consumers, in whom everyone can recognize his or her own situation. Thus, in the space of 2 or 3 pages, readers quickly find practical advice and useful tips on how to follow the recommendations adapted to their own specificities without having to dramatically change their way of life.

As a spin-off of these Guides, several general mass media campaign (using TV, radio, posters, etc.) have been developed which support the different recommendations of the Food Guides including a promotional campaign for fruits and vegetables or physical activities.

These campaigns are highly pragmatic and their messages are adapted to all situations.

For example, for fruits and vegetables, the slogan was “at least 5 fruits or vegetable, fresh, canned or frozen, raw or cooked,

nature or prepared”. For physical activities, it was demonstrated how they can be included among daily activities....

In order to reach as large audience as possible, different tools (posters, kits, etc...) have been developed for distribution at various levels (in schools, among caterers, in companies, etc...).

The success of a public health policy lies in the capacity to ensure that all the concerned actors participate in coordination of the program.

This is why the Steering Committee of the Nutrition and Health National Program includes all the stakeholders involved in the field: 7 ministries, several health agencies in charge of communication on prevention, health monitoring, food security, the Social Health system, the Mutualist Federation, the National Committee on foods, the National institute of research, the Association of Food Producers, catering services, food products retailers, consumers organizations and scientific experts.

This coordination facilitates the involvement and cooperation of the different stakeholders. For instance many actions have been developed in coordination with the Ministry of National Education.

These include:

- * the publication of a Guidance for the Composition of School Meals and for Food Safety, to improve school meals in terms of nutritional quality and food safety.
- * the project of integration of nutrition into school programmes
- * the production and distribution of educational tool such a national brochure recently edited for adolescents which will be distributed to teenagers by teachers taking part in teaching programs.
- * Analysis of whether educational materials produced by the food industry are in conformity with the PNNS.
- * The traditional, nutritionally inadequate snacks and light meals previously served in the morning in French schools have now been cancelled by an official circular sent to all establishment by Education Authorities.

While the PNNS is not a specific medical program, some of its actions are specifically oriented toward health professionals.

I won't go in details about all of these, but will simply highlight some aspects. Special versions of the national Food Guides for community-based professionals, particularly health professionals, have been produced and largely distributed.

Some actions are particularly oriented toward preventing, detecting and treating nutritional disorders in the health care systems:

- facilitating access to nutrition consultations, both in hospitals and elsewhere in the community, and developing nutritional care in hospitals by appointing dieticians and hospital practitioners,
- Producing adequate tools for nutritional assessment (such as a disk to calculate BMI or a specific disk to assess malnutrition in the elderly, etc...),
- Defining functions and professions in the field of nutrition, and revising the educational curriculum for health professionals,
- Producing recommendations for clinical practice,
- Distributing scientific reviews for helping professionals to introduce the objectives of the PNNS into their practice.

It is not enough to develop actions in the field of nutritional communication when attempting to inform the population on how to improve individual food behavior.

It is also indispensable to develop complementary actions to improve the nutritional quality of foods and the availability of foods which help to achieve the objectives of the PNNS.

The PNNS has urged the food producers to reduce the salt content of foods (especially bread, cheese, meat products and processed foods...) so as to reduce, by 20% in five years the average sodium intake of the general population. Health Authorities first contacted food producers to request their participation in this reduction on a voluntary basis.

A similar strategy is currently under discussion for reducing added simple sugars in food products.

Concerning food advertising, no efficient self-regulation has been possible with food producers. But prompted by French members of Parliament, especially Jean-Marie Le Guen, a specific regulation concerning food advertising was introduced into a Public health Law (promulgated in August, 2004), imposing an official nutritional message in all commercial advertisements for food products (on TV, radio, in the press and in all promotion activities). Food producers can avoid having to include this message by paying a tax to the French Institute of Prevention and Health education, to promote actions in the field of nutrition.

Under that same law, and in order to ensure coherence in nutritional recommendations, an article has imposed a ban on vending machines in primary and high schools.

Currently, debates and discussions are ongoing about providing consumers with clear and meaningful information on food labelling based on nutritional profile of foods. The goal is to promote the intake of certain foods and conversely to avoid excessive consumption of some others, avoiding to condemn specific foods.

The main challenge to the success of the PNNS lies to the capacity of the program to become operational at local actors (associations, municipal and territorial politic authorities, caterers ...). The national level has designed the recognized tools and it is offering a set of reference for the development of actions in the field. National and regional funds are available to enable field actions which will help to achieve the objectives of the National Program.

More than 150 experimental field projects have been granted for municipalities, associations, companies, schools, ...

A national charter was signed between the Ministry of Health and local municipalities (large, medium or small cities) which is committed to developing actions for attaining the objectives of the PNNS.

Finally, the main role of health authorities is to promote, initiate, design, coordinate and assess public health policies at a national level and to act as the guarantor of mutual cooperation, synergy and coherence in the different actions which are undertaken.

No action, measure, or tool alone can be considered as truly effective. It is the role of the steering committee chaired by the Ministry of Health to set up national programs, to coordinate and control this point!

It is also the role of health authorities to organise the evaluation of the program by checking the state of the objectives during and at the end of the program

A Monitoring and Nutritional Epidemiology Unit (Unité de Surveillance et d'Epidémiologie Nutritionnelle) was set up in 2001 with the mission of developing a surveillance system for nutrition at the national level, and especially for monitoring the objectives of the PNNS.

A national study will be carried in 2005 and repeated in 2008 on a representative sample of six thousand subjects, with measurement of food and nutritional status permitting verification of whether or not nutritional objectives have been achieved.

In conclusion, we should point out the difficulties encountered, and limitations inherent in the development of a French Nutritional Policy.

First, in order to develop the tools and referential settings of the Program, more time than expected was necessary; funds were not adequate for communication of the various aspects of the program; the creation of jobs for dietician and hospital practitioners was insufficient; difficulties were encountered when attempting to motivate regional actors; lobbying of the food industries; lack of a Food policy....

Jean-Marie LE GUEN

Deputy and Chairman of the Parliamentary Study Group on Obesity
Assemblée Nationale, Paris, France

Dr. Serge Herberg introduced the policies that were implemented in France some years ago and he defined the main principles of any nutrition policy. As far as I am concerned, I am in charge of obesity-related issues at the French National Assembly. Although both topics are in many ways interlinked, they are not interchangeable. Dealing with the nutrition issue is not only about promoting a balanced diet and a controlled calorie intake. As well, the fight against obesity is not limited to strictly dietary aspects, though these may prove determinant.

My intervention within the French National Assembly has turned into a private bill that has not been discussed yet but that was in part resumed in the document that refers to public health. Actually, two rather strong measures were voted about a month ago. We still need to assess how well they will be implemented.

I felt the need to put together a private bill that, while remaining within the guidelines of the PNNS, the French National Program for Health and Nutrition, would benefit from more ambitious means. It is the role of the Parliament and the National Assembly to provide administrations and experts with the means to conduct the desired policies. Of course, we fully agree with the principles of the PNNS, notably the idea that, as far as nutrition is concerned, recommendations and policies should not aim to make people feel guilty, nor blame or forbid anything, but rather emphasize such aspects as pleasure, conviviality and diversity. We want to stress this core message in order to improve our policies in terms of public health and the fight against obesity.

Nevertheless, the role of public authorities should not be restricted to a mere information supplier. Other orientations must be developed, that go beyond traditional responsibilities of experts and ministries.

More than informing consumers, we must call attention to the education aspect of the issue and we therefore need means that match the challenge our society is facing. Today, because of such phenomena as time fragmentation, loss of values, individualism in France and all industrialized countries, we can no longer rely on the traditional role of the family as a transmitter of dietary education. School remains a significant actor but it cannot teach our children "everything". Its public mandate is already quite demanding. Society as a whole, and particularly the media, thus has an explicit responsibility.

I therefore suggested that we first intervene on commercials that finance children TV programs. In France, a child watches television over two hours a day in average. Among these, at least fifteen to sixteen minutes consist of commercials, which comprise ten to twelve minutes of advertisement for the food industry. As Mr. Damiens explained earlier, those commercials do not advertise for fruit and vegetables, but they promote sodas, burgers, candy bars... Let's picture the case of a two-year old child who would discover the world within a loose, unbalanced family framework – if balanced family frameworks ever existed throughout history – and who would get food education only through television commercials: this child would know only a few types of products. We must respond to this situation: our first idea was to stop such disinformation about nutrition. Yet after

discussing the issue with experts, I tried to invert the process by making use of the funds invested in advertising for information and education purposes. Hence, the idea of encouraging (if not forcing) food industrials to include an informative message on health and nutrition within their advertisements. This proposal has been agreed upon and voted, but it has not been implemented yet. I would be happy to share with you the first results assessment of this new challenge in a few months.

Another way is to modify the environment in which consumers and children live. This means we should intervene on television, advertisement, but also on dietary issues of the whole population, notably the youth, in terms of economy and business; we should also take a closer look at mechanisms that govern today's dietary habits. We would then realize that the burden of direct marketing and availability/accessibility issues add up to regular TV advertising problems: in the US as well as in Europe, finding soda if you are thirsty - or a fast-food restaurant when you are hungry - will prove much easier than getting water – or fruit and vegetables. The whole economic background has to be questioned. The price issue also plays a crucial part: it proves determining, notably among under-privileged populations. From this perspective, bad dietary habits are very much linked with living costs. People who cannot afford fruit and vegetables tend to eat less of these, until they finally leave them out of their eating habits.

For those of you who would want to undertake political responsibilities, do not hesitate to select themes that you identify with, and to provide advice to your relatives and friends because there are great expectations around those themes in the general public. With regards to such expectations, we can be hopeful that a change through political action is indeed possible, at the behavioral as well as economic levels. The French are awaiting extremely dynamic policies as their awareness on major public health stakes is growing. I think that the philosophy of the PNNS matches a real expectation on the side of the French society. If we prove able to offer policies that impose limits on the media, business mechanisms, the food industry. We would certainly get support from the population.

The issue of nutrition raises deeper questions on our society: dealing with obesity means questioning business tracks in our country. In a few weeks, we will debate on hypermarkets and the issue of prices. Our recommendations on public health, in particular the need for nutrition and health education within hypermarkets, will most certainly upset the debate. But this can be done. Many MPs of various movements will probably take part in this initiative.

As we are facing a global issue on obesity and dietary problems, that certainly is linked to globalization, many possible ways of solution still need to be explored. Either we choose the "laissez-faire" and its disastrous consequences in terms of health, economy and society in our countries (including the impact on life expectancy), or we choose to control and improve our lifestyles, which I think we should do. While controlling the future has turned into a major concern among our fellow citizens, the dietary issue brings us at the heart of crucial questions around democracy and citizenship.

Antonia TRICHOPOULOU

Director of the World Health Organization Collaborating Center for Nutrition , University of Athens, Greece

Thank you Mr Chairman. Ladies and Gentlemen, I would like to thank the organisers for giving me the opportunity of being in Rome to attend such an interesting conference.

My presentation refers to how politics are involved and can a national nutrition policy be developed.

In Greece we have a national nutrition policy committee in the Ministry of Health. This committee has set five nutritional priorities in terms of public health.

The first is to reduce childhood obesity. The second is to increase the consumption of pulses and vegetables. The third is to reduce the consumption of meat and increase fish consumption. The fourth is to improve mass catering services with the application of food quality principles. The fifth is to increase consumer awareness on food safety and quality.

National Nutrition Policy Committee

Five objectives – nutritional priorities in terms of public health:

1. Reduce childhood obesity
2. Increase the consumption of pulses and vegetable
3. Reduce the consumption of 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.

Established by the Greek Ministry of Health

The plan of action in order for those priorities to be accomplished refers to three axes: training and education, research in the field of human nutrition, and a high level of collaboration between the Ministries of Health, Education, Agriculture and Development.

Plan for action in order to accomplish the priorities:

- A. Training and education
- B. Research in the field of human nutrition
- C. High level collaboration among the Ministries of :

Health
Education
Agriculture
Development

I think that these points are well-known to all of you and are similar to those in other countries, following either WHO or European Commission guidelines.

I would like to focus on the rationale of certain decisions that were taken in our nutrition policy committee in Greece and mainly on the one that refers to collaboration with the Ministries of Agriculture and Development.

One of the priorities is the consumption of vegetables and legumes in the Greek population. The domestic production of vegetables and legumes has decreased over the last few years leading to price increases and increasing imports of vegetables and legumes. So the demand is met by imports as domestic production is generally small. An increase in the consumption of vegetables and legumes will require an increase in domestic production, with the corresponding reduction in prices.

You may ask why we recommend to increase vegetable consumption in Greece. Greece is a Mediterranean country and vegetable consumption is among the highest in the EPIC centres and in Europe. Nevertheless, according to the DAFNE data (DAFNE is a databank which contains comparable and harmonised data between countries), the recommended vegetable consumption of 250 g per day is not being met by 50% of the population in Greece – it depends on the age group, the education level and the region. Of course, there are certain persons in Greece who consume 600 g of vegetables a day, but there are others who do not meet the recommendation.

DAFNE - Data Food Networking

Percentage of low consumers

Countries	Fruit < 150 g/p/day	Vegetable < 250 g/p/day
Belgium	68	76
France	58	71
Germany	45	88
Greece	38	58
Hungary	66	76
Italy	34	71
Luxembourg	41	83
Norway	68	83
Poland	81	75
Portugal	55	83
Rep. of Ireland	74	88
Spain	38	77
United Kingdom	70	78

Naska et al. BJN 2000

What about meat? From 1995 to 2001, domestic meat production declined (with the exception of poultry), but meat imports steadily increased – a fact that underlines the national cost of the over-consumption of meat. We do not produce meat. In the past we used lamb, goat, some pork, and we only consumed meat several times a month. The Ministry of Agriculture has calculated that if domestic production remained constant, reducing consumption by half would lead to a reduction of import costs by about 25%. Bear in mind that the money Greece pays to import meat almost equals the amount of money we pay to import fuel. So it is extremely important that a nutritional policy plan takes into consideration the position of the Ministry of Agriculture.

Our approach is to try to relate public health and nutrition intervention with agricultural policy. We are trying also to motivate small enterprises to produce traditional foods, because the Mediterranean diet is based on traditional foods.

Food quality is not limited to safety: it has organoleptic and nutritional characteristics related to food processing and is closely associated with the production area and its cultural dimension. This is very important because when we are promoting local traditional foods, at the same time we enhance the areas where they produce these foods and where people live in small villages in the country. So this issue has important cultural dimensions and quality is linked to specific production areas and cultural traditions.

Local traditional foods have health aspects, cultural aspects, they sustain the environment, because very often the local traditional foods respect the environment, and economic aspects, because they have added value and also because they keep people in their own environment and the countryside is not abandoned.

Talking about traditional food reminds me of what was happening 25 years ago when we started talking about the Mediterranean diet – nobody believed in it. Ten years ago we started talking about traditional food, and suddenly there are important studies. I am quite proud to tell you that in EUROFIR, which is a European Commission Network of Excellence project, there is a work package on traditional foods. In this work package we tried to define the term ‘traditional food’ because there is a lot of commercial interest and it is quite often misused.

Since I am in this beautiful and historic country, may I make a suggestion? There are 3 715 traditional foods registered according to the Italian definition of traditional food. However, the registration is according to a national definition which surprised me for a country like Italy: they call ‘traditional’ every product which has been on the market for 20 years. I think that

when we call something traditional, we should have to go back at least 50 years – at least for countries like Italy, Greece and Spain.

We hope that our traditional guidelines of the Greek Ministry of Health, which are based on the traditional Mediterranean diet, can be implemented more easily if traditional foods are on the market. That is why we are going to encourage small enterprises to produce them –we will have quality foods, and we will also respect the environment and keep the people in the villages.



So, in our small area of endeavour, is to allow the traditional Mediterranean diet to flourish in spite the wave globalisation. Thank you for your attention.

Finnish experience on national policies and strategies for chronic disease prevention

Pirjo PIETINEN

Head of the Nutrition Unit, National Public Institute, Helsinki, Finland

I want to thank the organisers for inviting me here; it is always a pleasure to be in Rome.

I will give you a very quick overview of what has been going on in our country. I chose to do this because Finland is one of the few countries which have been working in this field, having had food and nutrition policies for chronic disease prevention for many decades. My point will be that it is not a campaign; it is hard work for many decades, it is endless and everybody needs to be involved.

We really started in the 1940s right after the Second World War. For example, we have had a free school lunch in every school in the country since that time – it is one of the cornerstones of children's nutrition in my mind – and we have had fortification programmes since the 1940s and 1950s. To give you an example, we put iodine in salt in the early 1950s.

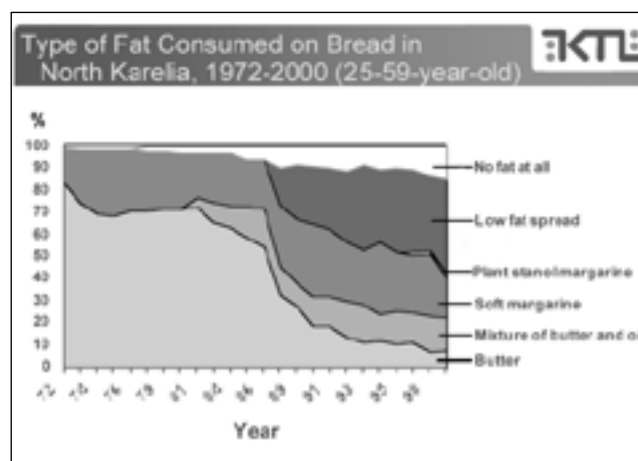
In the 1970s the main emphasis started to be in chronic disease prevention, because we were the leading country in coronary heart disease mortality in the late 1960s and early 1970s, and that was the start of the North Karelia Project. More recently, we have new problems – some of the older problems are gone. Now it is weight control and prevention of diabetes that are among the most important issues to be tackled.

As many of you know, the North Karelia project was one of the first community-based intervention programmes. It started in the early 1970s and was able to show that you can actually change the diet and lifestyle of ordinary people. It has a huge impact on their risk of coronary heart disease especially.

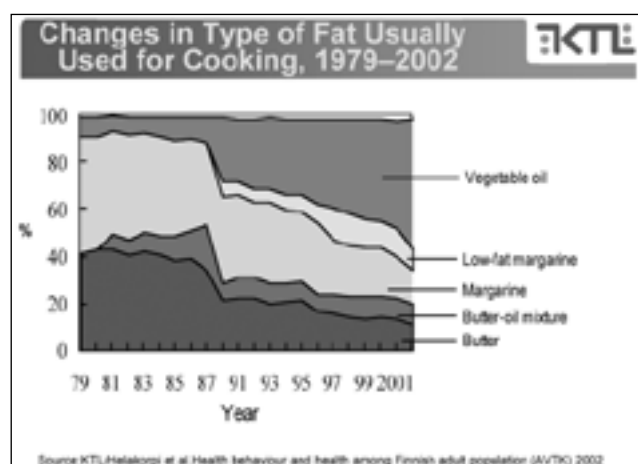
It had several elements, from media activities to training professional workers, environmental changes working, with the food industry and supermarkets, as well as establishing regular monitoring systems.

It is useless to educate an individual and persuade him or her to change his diet or other lifestyles if the environment does not give any help. For example, it is totally useless to talk about using less salt if you do not make a nice variety of low-salt breads and other foods available in the supermarkets. It is totally useless to try to educate teenagers not to use the vending machines in their schools; you have to take the vending machines out and offer something more healthful instead. You cannot put a person in an impossible dilemma time after time – it just will not work.

I will give you some examples of the dramatic changes that have happened over the years. Bread and milk were the main carriers of saturated fats in the old days. The picture has completely changed (Figure 1). Here you see that butter consumption dropped, especially in the mid-1980s. We have on the market a beautiful variety of different kinds of fat spreads which have different oils in them, and the newest are the plant sterol and stanol margarines. So this has completely changed. When people shift from fatty milk to skimmed or low-fat milk, the saturated fat that used to come from milk drops dramatically. Different types of margarine plus oil have come to the market for good.



There has been a dramatic change from fatty milk to skimmed milk and low-fat milk. Rapeseed oil and canola oil, which is now locally produced, has replaced butter in cooking (Figure 2). This has also been very important for the agricultural sector because it gave business to the old dairy farmers.



The sources of saturated fatty acids have changed completely; the number one is now cheese, especially in young women because they avoid other dairy products or use low-fat varieties. There is a drop in serum cholesterol both in men and women, which has levelled off though, but there is concern that new types of sources of saturated fat have become fashionable, especially among the younger generations.

We have a symbol launched by the National Heart Association; it says 'Better Choice' in Finnish and Swedish. Companies can put this logo on their products if the product meets certain criteria: is reduced in salt, high in fibre, its fatty acid profile is good, it is low-fat, etc. This is being increasingly used and helps the consumer tremendously in the supermarket. If you see different kinds of bread and you see this symbol on one loaf, then you automatically know that it must be a healthy choice, and you do not have to look at the label and read the small print.



Changing the diet at the population level requires systematic work. It is not just one campaign and you really have to work with the industry, the people and the health-care sector – you have to get everybody involved. It still takes a lot of time, and if you quit putting your energy into it, it is finished.

Consumption of Foods of Plant Origin in 1979–2001

kg/person/year

Year

Food balance sheets (2001 = preliminary)

Year	cereals	fruit	potatoes	vegetables	sugar
79-81	65	70	65	30	38
82-84	70	65	70	42	38
85-87	68	70	68	48	37
88-90	78	78	65	55	37
91-93	78	78	62	55	37
94-96	75	75	62	62	37
97-99	78	78	65	62	36
00-01	78	78	65	65	35

Figure 4

What made the vegetable revolution was that in the early 1980s, the trade unions made an agreement to subsidise worksite lunches. It still happens. Most of us have a warm worksite lunch and there is always a free salad bar. Imagine a factory with blue-collar workers and there is a free salad bar. The meal is a package – if you do not take the salad you still pay the same. Of course, everyone tries to get the maximum for their money. This really increased vegetable consumption, especially in men.

In a little country, it is easy to have political consensus as well as consensus in the medical community. Everybody has been very supportive. Nobody has been against these activities and the food industry has been quite cooperative.

We do have a growing concern about overweight and obesity but fortunately, our situation compared to England, for instance, is not as bad. However, this is one of the issues we have to tackle – more in men than in women.

We need to get vending machines out of schools. This movement is going on, but not by any governmental decree. It started about two years ago with concern from the Dental Association. The dentists noticed that even though we have a decline in dental decay, it is levelling off. The Dental Association, the Minister of Health and our institute put our efforts together and simply started a discussion. The media loves the issue and has given it good coverage, so now more and more schools are offering a healthier snack for a small sum or encouraging the students to bring a piece of fruit from home and they are simply taking out the vending machines. Legally, if the school system is being paid for by us taxpayers, we have the right to see that there is nothing unhealthy on the school ground.

We need new ways to increase fruit and vegetable consumption because we know there are still groups in the population where the consumption is not enough. Thank you.

Donato GRECO

Director General of Health Promotion
Ministry of Health, Rome, Italy

I come from Naples, the capital of the Italian Mediterranean diet. I would like to take this opportunity to remind you that within the original campaign origin, one of the most relevant studies ever made on the health effects of the Mediterranean diet was launched, and many scientists from the US and Italy helped in the study.

As I think we are going to be overwhelmed with the 'dietary story' over the next few days, I thought I would use the next five minutes to tell you some other news about what Italy is trying to do.

After 29 years in science, I moved to implementation because I felt strongly about this enormous gap between what we know should be done and what is done.

We have seen that there is a gap in this country, in your country, as everywhere. We have known for a long time that we should eat more fruit, that we should not smoke, and that we should walk for an hour a day, but in fact there is little evidence that the population is moving, rather a lot of evidence that the population is going the other way. So we have to do something about this impact gap. Of course, I do not have a solution – otherwise I would not be here.

We are trying to create a new programme with a new institution to try to get science messages through to the population. This is why our parliament approved through a new law last year the Italian CCM, Il Centro nazionale per la prevenzione e il Controllo delle Malattie [The national centre for prevention and control of diseases]. It is a network between the regions and the many institutions to build our capacity to work together in a network. Our mission is to help attain assessment, surveillance and response in coordination with the regions. Each of the 21 independent health authorities of the country are becoming more and more independent. They have their own ministers, parliament and funds (funds are not managed in Rome anymore, but remain where they are collected.)

So we have training to do, presentation, networking, and information feedback. It is a very heavy mission. To start with, we have been given 6 tasks: infectious diseases, health promotion, environment and climate, vaccines and vaccination, road and domestic accidents, and bio-terrorism. This covers the country's major health problems.

We have a small additional budget on top of our main budget which allows us and the network to function. This fund is granted every year and is protected against any cuts by the government or treasury minister.



We have a national plan for active prevention, the word 'active' being a message we would like each citizen to hear; we want to reach them in their homes.

Of course, when we speak about these diseases, we are speaking about the major causes of disease: 250 000 deaths caused by cardiovascular disease and more than 1 million sick people every year at any given moment. Diabetes is now our great challenge: according to our treasury calculations, our entire health budget in the next ten years will be barely sufficient to pay for diabetes only – let alone the rest!

Our actions must include cancer screening. I have just come from the World Health Assembly in Geneva in which cancer control was one of the items discussed, and again, diet is crucial, as one third of cancers are associated with diet.

What are our main points? Smoking: I am proud and pleased to say that we are now one of the leading countries in the world for combating smoking because we have approved a quite stringent and effective law that forbids smoking in all public places. Believe it or not, despite our 'illegal' attitude – we do not usually like to respect red lights – the Italian population is accepting this law very happily. We have figures showing a minor drop in consumption of cigarette sales of about 10% a month, and out of the many tens of thousands of police inspections of restaurants and bars, less than 3% were fined for irregularities. The population is happy about the restriction of smoking in public places. However, we are not forbidding smoking: this is not a law against smokers; it is a law against passive smoking to protect the non-smokers. Things are going very well.

Physical activity: over the next few days you will hear in different presentations how people are not inclined to move and walk.

Nutrition, of course, is a major issue, as has already been mentioned by other colleagues.

As in many other European countries, alcohol is our problem, but I am pleased to say that our total alcohol consumption over the last ten years has decreased by more than 20%. We are drinking better and drinking less, and we are not much fond of spirits. Although alcohol consumption is going down, Italy, like most countries, do have a huge problem with alcohol and smoking among the young – youngsters love beer and there are many new pubs springing up, even in Rome.

There is good news, however. In general, all programmes are applied to Rome and nothing happens in other regions. However a few months ago the 21 regions signed a pact with the State to engage in this national active prevention plan for three years from 2005 to 2007. (The plan is the one I showed you earlier). What is also important is that 1 320 million euros have been set aside for these five items, including nutrition and physical activity. Historically, this has never happened. This is part of Italy's 90-billion-euros health budget, not an enormous amount, but significant enough so that there is no longer any justification for the 250 local authorities or the 21 regions not to act in accordance with the national guidelines which aggressively address the risk-factors we will be speaking of over the next few days. For once, the money is directed at the target – which sounds very simple, but that never happens in this country! The regions have to start implementing this action next month – otherwise they do not receive the funds.

Finally, there is a mechanism to assist regions as well as a verification mechanism whereby each region has to be periodically certified on the active prevention plan within its own territory to get its quota of money. I am quite hopeful and believe that this mechanism will make it difficult to deny or divert the money to pay for other things.

This is a heavy task and I strongly hope that over the next few days of this meeting, we will go in the direction that Italy is ultimately trying to take to fill the gap between science and the benefits to the citizen.

Thank you.

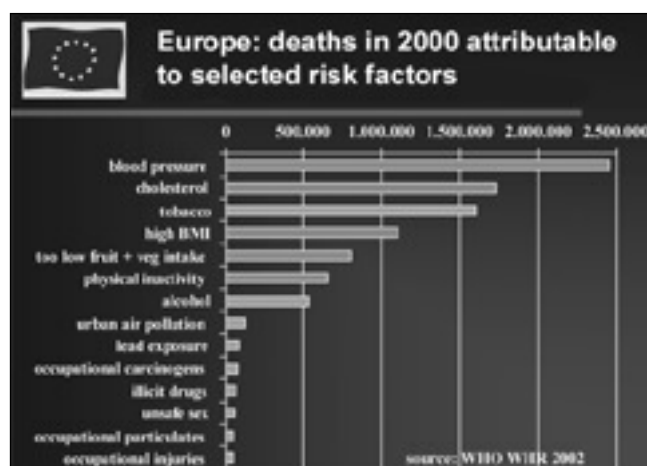
Community action on nutrition and physical activity

Wilfried KAMPHAUSEN

Principal Administrator, European Commission
 European Commission, DG SANCO G/3 Health and Consumer Protection, Luxembourg

Good evening, Ladies and Gentlemen. I am very honoured to have been invited to speak at this third edition of the international conference on health and the Mediterranean lifestyle. We have to congratulate the organisers for choosing such beautiful surroundings in Rome for this meeting. Even more so as it is an even greater pleasure these days to go into an Italian café or restaurant because the Italian government has had the courage to ban smoking in public places, for which I think they deserve our congratulations.

In my talk, I would like to evoke the need for action on nutrition and physical activity because of obesity and diabetes. A lot has already been said on this but I would like to add a few elements. I would then like to show how the Community goes about building a strategy in this area.



There are many ways in which you can present the effects which nutrition has on health and on health risks. This is one of the ways I like the best. This graphic gives you a breakdown of premature deaths in Europe by risk factors. One can say that 6 out of the 7 main risk factors for premature death, including alcohol, relate to the way in which we eat, drink and move – the odd one out being tobacco. I think we still have a lot to do when it comes to creating awareness in the media. If you look at the bottom half of this list, there are many elements in there which make people very much afraid, but they are in a totally different order of magnitude. I think you will be glad to see that fruit and vegetable intake is one of these factors where we still have a big margin for improvement and where a lot still needs to be done.

We know that by changing lifestyles it is theoretically possible to avoid up to 80% of CVD cases, up to 90% of type 2 diabetes, and up to one third of cases of cancer. We have heard from a lot of studies here today that the Mediterranean diet can make a great contribution to this.

Information and education is important – it is essential for changing behaviours. We have heard today that you can change behaviours without having to spend too much time and effort on education and information, which I found a very interesting point. We have also heard that changing the environment is also a very important factor if we want to see improvements in this field.

I will say a few words on obesity. These are the figures from a few selected countries. We can see that we have the usual suspects – like the United States – but we can also see that countries like the

United Kingdom come very close to the situation which, in Europe only a couple of years ago, we ridiculed a little – “Yes, the Americans have this obesity problem, how terrible...” We have it in our own countries now.

It is even more worrying if we take a look at trends in obesity. These are some figures for the early 1980s, some for the late 1980s, and some for the 1990s. If we look again at the United Kingdom, we can see that in a period of less than 20 years, obesity has trebled. That is very worrying indeed.

The situation is even more worrying if we look at overweight in children – so this is not obesity, this is overweight with a body mass index of over 25. These figures from the International Obesity Taskforce certainly give the picture and the trends. We see that in the Mediterranean countries, the figures are fairly high. Nutrition is one element of the picture and you can certainly argue how much children in the Mediterranean countries now still benefit from the traditional Mediterranean diet. We have had globalisation all over the world, and certainly children here are as keen “junk food” eaters as they are in other parts of Europe.



Physical activity also plays a part. Here are some statistics for young girls indicating the number of girls, broken down by age group, who meet certain guidelines – the guidelines being that you should have 30 minutes to 1 hour of moderate physical activity a day. You can see that there are very few countries – Ireland, in fact, is the only one – where about half of the girls in the younger age group meet these criteria. You can also see that there are fairly low levels for the Mediterranean countries. When we look at the obesity issue, we must never forget that it depends on ‘energy in and energy out’ and that physical activity also plays a part.

Obesity and diabetes: there are estimations which say that more than half of the European population will suffer from type 2 diabetes during life. We know the risk factors: obesity and central adiposity, physical inactivity, excess calorie intake.

The World Health report estimated that more than 50% of diabetes globally can be attributed to high body mass index. We know that obesity and type 2 diabetes are linked. There are a number of studies to confirm that. One example is the nurses’ cohort study in the United States which established that the risk of diabetes was increased 5 times for individuals with a BMI of over 25, and 93 times for those who were heavily obese with a BMI of over 35. WHO predicts an explosion of diabetes figures worldwide by 2030, and though it is

true that we will see most of this increase in the developing world, the situation in Europe is also very worrying. These are estimates for 2000, and these are projections for 2030. Again, some of the Mediterranean countries – Greece, Italy, Portugal and Spain – are fairly high on this list. Again, it is a question of nutrition and physical activity – amongst other factors, certainly.

If we look at physical activity once more, this is a slide showing how many people stated that they did not have any physical activity in a typical week. The European average here is around 30%, with Portugal, Italy and Greece fairly high above this level.

Life expectancy: we have had a very positive picture over the last 40 years, with an increase both for males and females in the order of 7 to 8 years of life gained in that period. Now, there are scientists who predict that children born today will in fact have a lower life expectancy than their parents, and they say this is due to the obesity epidemic.

WHO and the Federal Agricultural Organisation have very nicely summarised the evidence for obesity risk. There is convincing evidence that obesity risk is increased by a high intake of energy-dense foods and by a lack of physical activity. There is convincing evidence that risk is lowered by a high intake of dietary fibre and of fruits and vegetables, and by regular physical activity. There is probable evidence that risk is increased by sugar-sweetened soft drinks and fruit juices, and by heavy advertising of foods which you would normally consider less healthy. Something that is worrying us very much at a European level is the amount of advertising of energy-dense, nutrient-poor foods to which children are exposed, especially on television. There is also probable evidence that low socio-economic status contributes to obesity risk.



There is probable evidence that the risk is reduced by breast-feeding, and by supportive environments at home and in society in general.

What do we want to do at the Community level about all this? First of all, we have to improve the data we have. Why? All of us know the trends, but if we want politicians to make changes, they will ask us for hard and comparable data. We still have to make some progress in this area.

We need to increase the overall awareness of the understanding of diet and physical activity for health, and increase the awareness of the potential which healthy lifestyles can have to reduce health risks. We need to do that among the general population, among the politicians, and also – and very importantly – among the media. We need to make sure that best practice is disseminated. We need to promote the healthy choices and physical activity. We also need, very importantly, to orient other Community policies towards taking public health and nutrition objectives into account. There are some things we can do within the health policy at Community level, but there are many more things which can be done by, for instance, the Common Agricultural Policy, education policies, sport policies, and also by policies linked to town planning, buildings design and many other things.

In order to develop a strategy on this issue, we have created a European network on nutrition and physical activity, with participants from various backgrounds appointed by Member States. The objective of this network is to advise the Commission on the establishment of a Community strategy on nutrition and physical activity.

In parallel, we have looked very intensively over the last year into ways and means of getting industry and the economic operators on board in the fight against obesity. There were 3 questions asked to the food industry. Will they publicly commit to devoting more resources to fighting obesity? Will they accept that other bodies will control what they are doing in this field? Will they accept to draw up benchmarks and verifiable objectives in the field?

In the meetings, we had the impression that such an approach was at least worth trying, and therefore we established in March this year the European Platform for Action for Diet, Physical Activity and Health, which brings together European-level umbrella organisations of the food industry and also of the consumer and health NGOs. We also have the advertising industry in there and the broadcasting associations, and also the scientists and international organisations to advise us.

The objective is to sit down with the Platform members to establish first of all a base line, which establishes what they have been doing so far in this field. Once we have agreed on that, we want them to commit publicly to what more they will be doing in this field over the next year. These commitments can be of a very different nature. For instance, there can be commitments to withdraw vending machines from schools or to change the content of the vending machines – putting fruit instead of chocolate, mineral water instead of soft drinks – and there can also be restrictions on advertising to children.

We also want this forum to help us to better identify best practice in this area. We also want it to better integrate the contributions which other EU policies can make to the issue. We want to see achievements come out of this also in the field of self-regulation as regards certain forms of advertising, and my Commissioner has made it very clear that if this does not happen, then we will have to consider regulatory means.

The platform development will be continued and evaluated for the first time in the middle of next year. We will have a debate on obesity in the Health Council on 3 June; the Commissioner has prepared an issues paper for this purpose and the Council has prepared Council conclusions, which will become public very soon. The Commission then intends to prepare a Green Paper on nutrition and physical activity, which will be available towards the end of this year and which will launch a very broad consultation. We expect replies from all kinds of players in society to the basic alleys which will be portrayed in this Green Paper. We will analyse them very carefully, and we will then come forward with a Commission communication on nutrition, physical activity and obesity by the end of next year.

We all know that diet and physical activity are very strong determinants for a number of very serious diseases. Obesity depends on what we eat on the one hand, and on the energy we expend on the other hand. The food industry is no scapegoat, but the food industry certainly is part of the problem and so therefore should also be part of the solution.

We know there is a lot more that needs to be done in order to enable consumers to make the healthy choices. For instance, fruit and vegetables need to become more available, affordable and accessible. We know that advertising and marketing of certain food products to children is a very critical issue.

We hope the platform will show results by the middle of next year, and we are very convinced that the Mediterranean diet can make a significant contribution to healthier lifestyles.

You can find more information on our website and I would like to thank you very much for your attention.

Conclusion

Antonios TRAKATELLIS

Vice-President of the European Parliament and member of the Commission of the Parliament dealing with the environment and public health, European Parliament, Brussels

Thank you very much. Firstly, I would like to thank the organisers for inviting me to such an important meeting. I must say that the contributions were great and I think this has been an extremely important meeting.

There is no doubt that the accumulated scientific evidence clearly shows that there is a very close relationship between nutrition and state of health. Good nutritional, and consequently healthy diets can not only prevent diseases, as we have heard from many contributors today – cardiovascular diseases, certain cancers, obesity, diabetes – but can also significantly contribute to a higher life expectancy. Needless to say, good nutrition is a great contributor for a good quality of life in aged people.

Taking all this scientific proof into account, it is now important to turn it into actions, measures and programmes, not only at the national level but also at the European level. I have to remind you that this is an obligation at the European level which is even in the treaties – in the old ones and even in the new treaty now under discussion in the various States. The political will is there and it is increasing. The citizens of Europe are very interested in all these subjects for many reasons – the nutritional crises we have had in the past, people have lost confidence, consumers are very interested, NGOs are following this subject very closely – therefore there is pressure from the public and the political will is growing. We therefore have to consider what we can do in this area at the national level as well as at the EU level.

We have done many things already. For example, we have a programme (which I introduced as the rapporteur) for public health which runs from 2003 to 2008. It is very innovative because it is basically a programme of collecting and analysing data – all kinds of technical data and also data on lifestyle, nutrition and other factors. This is very important because by collecting and analysing this data, you can really come to understand what the health determinants are – the important factors today which make a person to go from a state of health to a state of disease. I will read you this definition: 'Health determinants can be categorised as personal behaviour and lifestyles, influences within communities which can sustain or damage health, living and working conditions and access to health services, and general, social, economic, cultural and environmental conditions.' It is very important that this part of the programme is called Positive Health, Nutrition and Physical Activity. We should continue to collect the relevant data.

We now have a new programme which we will be discussed in the Parliament. The proposal is from the Commission and it will be the new public health programme. The previous programme is still in progress and will run until 2008, and the new programme will run from 2007 to 2013. The new programme will focus on public health issues, as does the previous one, and it will continue with the same ideas of collecting data and analysing health, but it will also address certain consumer-interest issues. In other words, it will be a combined programme. To show you how we are advancing in this area, I can tell you that the previous programme now running has been invested with around 400 million euros, and the new programme will be invested with 1.4 billion euros – about 4 times as much. We therefore have a political interest and a political strategy for doing more for public health in Europe.

First, we have to act – and we are acting. Secondly, we can

continue research in this area – research in nutrition is very important. We are going to put this topic in the seventh research framework programme which is now under discussion. This is important because when we have the data then it can be used to strengthen public interest and consequently the political will.

The third thing we can do has to do with the education process. It is very important to introduce this subject into schools. As a subject, nutrition is not like history, which can be understood and taught using regular teaching tools; nutrition has to do with acquiring taste and learning and following new habits – in other words, by eating fruits and vegetables. You cannot learn nutrition by reading a book; you have to acquire a taste that you can follow in your life.

We also have to make sure that governments and the EU spend money on these types of programmes that provide fruit and vegetables. We have to convince them with data collected from this programme. You could apply for a project using certain parameters obtained from schools in these pilot programmes to compare children with a population of children that do not have this opportunity of having vegetables – you are sure to find very important data there. This is very important because you then have something very powerful to push governments towards this particular programme. Therefore, teaching, education, teaching nutrition, acquiring taste, and having the data to prove the importance of these programmes are some of the things that have to be done.

Fourthly, the information campaign is also very important. An information campaign is something we can do at the EU level. We already have an information campaign on cancer – we could have an information campaign on nutrition. Why? Firstly, because people are getting more and more information – people know more about cholesterol today than they knew 50 years ago and they try much more to select what they eat based on the knowledge they have. It is also important for another reason: if you have a business, then you try to go with the trend. Do you remember having a vegetarian dinner on an aeroplane 15 years ago? No – but you do today. If you have a restaurant, it is good for business to offer vegetarian meals to vegetarians, and it is good to offer something tasty. There is a misconception that healthy food is not tasty and it is not true. So industry can do quite a lot to improve and present 'healthier' products for children or adults. Therefore, an information campaign increases public awareness over what we choose to eat, and also increases industry awareness of what they should do in the new environment, which is different from before.

The fifth point will be covered by coming European legislation and has to do with labelling – what goes on the label for all products. I think we can improve quite a lot on this because I do not think labels satisfy the consumer today. Why? Take a bottle of water. What do you see on the label? You see a number of constituents – for example, sodium is 3 mg per litre. If you are a consumer, what does that mean to you? Do you know if the sodium level is high or low? It is useless information for the ordinary consumer. Labels have to be meaningful to the consumer. The consumer should be aware that this food has more cholesterol than it should, for example. This is something that really informs the public and also pushes the industry to promote healthier products, so labelling is very important. I know that the Commission is studying various kinds of labelling. We are

introducing it for certain kinds of foods, but we have to do it in a meaningful way for the consumer. I think this will also have an influence in the calculation of good nutritional habits.

The sixth point is something we have already done in part and is to do with special diets and traditional foods. What are special diets? These are diets for athletes or bodybuilders – there are all sorts of special diets. These will come under several kinds of EU legislation within 1 or 2 years and we have to agree with Council what this particular legislation will include. The same is true for traditional foods, some (not all) of which are very important in conserving healthy habits – olive oil, for example. These special kinds of foods and traditional foods are very important and merit our attention for coming EU legislation.

I have a seventh point which is a little controversial. It has to do with using financial tools. This is the most difficult part and will meet the most resistance, but let us discuss it. It is taxes – lower taxes or higher taxes. This will meet the most resistance because people will say that it is against competition in a free market. However, you have to remember that we also have other priorities in the European Union, and public health is a priority. If you think about how much money is spent by national governments on health services – we spend billions of euros –

then you will appreciate the need to use all sorts of tools to really get rid of this high bill for providing services to people who suffer from cardiovascular disease, cancer and many other things. If we make an effort, we can succeed in doing something in this area by using financial tools for promoting good traditional habits in order to alleviate or prevent diseases. An important part of these financial tools would be cheaper advertisements in the media for these kinds of issues, because advertising is very expensive today. If the media agreed to promote these kinds of advertisements for healthy food, healthy habits or information campaigns, that will also be great.

These are tools we can use in the future. We have the coming EU legislation and I am sure many things can be done at the national level. National governments can do a lot of things, especially in schools, by promoting these nutritional habits and behaviour in children very early. We will do our share at the European level regarding data-collecting data programmes, promoting research in the field, or even using some financial tools in order to make sure that Europe changes nutritional habits. That will be a great contribution to public health because if we can change and introduce healthier habits to the citizens of Europe, we will definitely have a fantastic effect on public health and on the prevention of many diseases. Thank you very much.

Discussion

Member of the audience – *President of the Society of Journalists, France*

I am pleased to hear that there is going to be much more money and political strength behind the health policy. I am now President of the Society of Journalists in France, but I started 25 years ago as a doctor. Money is given to the doctor as a drug distributor. Our teachers and hospital heads were given money by the pharmaceutical industry. The doctor's role is not even being thought of. The social security system in France does not recognise prevention consultation and the doctor is supposed to give therapeutics. At present, prevention is not a recognised medical act reimbursed by the social security, so there is a very important economic background if you want doctors to be involved in this programme.

I was appointed to train their managers in marketing advice in a big distribution system called Auchan 15 years ago. I explained what we explain today: lower the sugar, salt, saturated fat, change the fat, push omega-3. We did a nice campaign on salmon, but in the background there was an enormous amount of money being put into the promotion of fats, sweets and salted products. Again, 15 years later, I have been appointed by Auchan to re-do the same training, and they are much more open this time. They say it is fantastic, you are right, but when we promote these fruits and vegetables and bio-products (and they even tried Max Avenir), nobody buys them.

I think that if we want the industry, the distributing networks and the doctors to be involved, they need some economic incentive. I think the industry can make money with good products; I think the doctor can make money with prevention, but this also has to be economically rewarded. It is David against Goliath at the moment, and that is what I have been experiencing for 25 years. We have been sending good messages but there have been no means behind. That is why I am so pleased to hear that Finland has done it and that Europe is going to do it.

Jean SALES - *A French producer of vegetables and President of the Council of the National Office of Fruit and Vegetables (Conseil de direction de l'Office National des Fruits et Légumes)*

I wish to intervene again on the problem of price. Before this round table, one of the eminent speakers expressed to me the irritation of the scientific community regarding the problem of the price. This question also concerns me. If a better accessibility can be obtained by a reduced price and makes it possible for all to consume fruit and vegetables, in abundance, daily, under all the social and economic conditions, we will all be very happy. However, in their great majority, the speakers tackled this problem by implying that the price of the fruit and vegetables was too high. The weight of the moral and scientific authority of the scientific community is such that it is important to be prudent in such statements. I propose to you, before the next EGEA, that a study be carried out by independent experts, agronomists, lawyers and economists, in order to determine whether, according to qualitative conditions which you state, fruit and vegetables are more expensive than other food. Mr Kamphausen said at the beginning of his intervention: "I was tempted to choose an ice-cream at the corner of the street because they are splendid and good". I imagine that this ice-cream would have cost approximately 3 euros. If in the cone he found pieces of kiwi instead of ice cream, at the price of 3 euros, wouldn't he have found that it was actually very expensive? Thank you.

Jacques VANOYE – *President of Apple Marketing Commission, France (Président de la Commission Marketing Pommes, France)*

My question is mainly for Professor Trakatellis and the political authorities. How do you explain that while almost everybody at the scientific and political levels agree with the fact that we have to change our nutritional habits, at the same time the EU has reduced the budget dedicated to the promotion of fresh fruit and vegetables?

Elio RIBOLI

That is a specific question. Are there any other comments?

Member of the audience

I have two questions for Antonia Trichopoulou. You mentioned that over the last few years in Greece, vegetable production has decreased. Why was that? Was it because the crops were bad, or was it for deeper reasons, that the producers leave agriculture and there are no young workers to replace them, for example?

What do you think is the main problem in the Mediterranean countries for maintaining the traditional Mediterranean diet? Is it that the consumption patterns are changing from a traditional diet to a less healthy diet because of globalisation? Or is it that the producers of traditional products in general are finding difficulties because they must compete to keep their production levels or even the quality of their traditional products? If that is the case, maybe we should think of specific supply policies and of new ways to promote these traditional products, both in our country and abroad.

Elio RIBOLI

Are there any other specific questions or comments?

Member of the audience – the Netherlands

I have a question for Professor Pietinen. I was very interested in the food-labelling system you have now in Finland for 'Better Choice.' We are thinking of this ourselves in the Netherlands but we are struggling with what is best, so I was curious about your experience in Finland about how to arrive at this healthy stamp.

Elio RIBOLI

We have three specific questions. One is about why the European Union has reduced the budget to support the promotion of fruit and vegetables. Who would like to answer?

Wlfrid KAMPHAUSEN

I would suggest that for the next edition of this conference, you invite colleagues from the Commission's General Directorate for agriculture. I am speaking here for the General Directorate for health and it is a known fact that we do not always agree with what

our colleagues do in the agricultural policy. The most prominent example of this is the fight we had for many years on the tobacco subsidies, where we, as the health DG, were campaigning against smoking, whereas our colleagues in the agriculture DG subsidised very heavily in a totally different order of magnitude, with about 1 000 times the amount, the production of tobacco in Europe.

Changing things in the agricultural policy takes time, but it is also possible. The Commission is officially committed now to phasing out the tobacco subsidies, and now that is over, I think we have to look into other issues. Certainly, the possible imbalance between promoting meat products, cereal products and full fat milk products, and the promotion of fruit and vegetables, is something we will have to look into. These are things which are going on at the Commission level between the Commission services. However, I cannot defend here things which are decided in the agriculture DG, so I would suggest that for the next edition, you invite a colleague from DG Agriculture. These are very interesting questions and I think they need to be debated.

Antonios TRAKATELLIS

I would like to say that the European Union's agricultural policy is a very important of the European Union. I have to remind you that a great part of our budget, maybe 40%, goes into this area – and rightly so, because we have many people employed in this sector. Having said that, I would agree with Mr Kamphausen from the Commission that it would be a good idea to invite somebody from that important sector of the Community to contribute his point of view.

However, I will also say that overall, we have increased expenditure in the area contributing to better nutrition. I have to remind you that we have the public health programme and we are occupied with many kinds of legislation in the European Union, especially in the area of nutrition. Therefore, European Union interest, according to my estimation, is increasing. Why? Because public interest is increasing and the political will is there. I think we have to continue pushing in that direction and we are probably going to have changes in the agricultural policy in the near future.

Elio RIBOLI

Thank you for this comment. It is certainly very reassuring from my point of view to see the major improvement in the balance of the allocation of funds from what was the case 6 years ago when the Europe Against Cancer programme was allocated 12 million euros to fight against cancer, and the growth in tobacco production was allocated 1 100 million euros the same year. Obviously, that created some uneasiness for those who were fighting to prevent cancer. We are very pleased to see that things have substantially improved now at the European Commission and European Union levels.

There was a specific question for Antonia about why there is a decrease in the production of fruit and vegetables, and a decrease in consumption.

Antonia TRICHOPOULOU

The decrease in production is related to the fact that it is not economically rewarding for those working in fruit and vegetable production. They usually prefer to work in big hotels or in big cities. That is why our nutrition policy will focus on traditional foods which are very often of high quality – thus having an added value, they might attract people to go back to producing them.

As for maintaining the Mediterranean diet, you might know that there are several actions. One started in Spain with the Society for the Advancement of the Mediterranean Diet. Another was initiated in Calabria and is now moving to the university in Rome. It is not limited to the EU Mediterranean countries but also includes the North African and Middle Eastern Mediterranean countries. There is also a movement in Greece. We collaborate with all three networks and our first task is to agree on a definition of the traditional Mediterranean diet and the definition of traditional foods, because I think they are related to health, culture and the economy.

Elio RIBOLI

Thank you, Antonia. There is now a question for Dr Pietinen about the food-labelling system in Finland.

Pirjo PIETINEN

You are referring to the 'Heart Health' symbol launched by the National Heart Association. It required a lot of work to set up the criteria and they are food-specific. I have not personally been in that group, but if you send me an e-mail, I will find out about the present criteria for you. I think it is good to know the available criteria that could possibly be modified for the Netherlands and you would have an idea on what we ended up using.

Elio RIBOLI

I think this is an extremely delicate issue. I have been involved in discussions at different levels about the meaning of labelling what is healthy and what is not. I think it may be important for future occasions to have a specific discussion on what evidence there is that this kind of labelling would improve consumer choice. There probably is evidence, but there is also a lot of concern raised by the food and distribution industry about what it would mean having red, orange and green, for example, labels – what is bad, very bad, may be bad, very good – put on different foods. I think it is a very important issue.

Pirjo PIETINEN

This label only means that it is a super-healthy product – bread with low salt content, reduced salt content and high fibre content – there are no greens or yellows. It is a sort of guarantee that if you choose one of these products, it is a good one.

Elio RIBOLI

This is very important because it is one of the options. Is there any last comment?

Member of the audience

I am from Freshfel, the fruit and vegetable industry body representing the industry. You spoke about the 6 million euros being cutback to 4 million euros and I would hate the questioner to go away with the opinion that the industry is doing nothing about that. I happen

to assist as Vice-President of the consultative body for the Commission. We have been writing to the Commission about this cutback and making representation at various meetings of the consultancy with the Commission about this, because to us, it is incomprehensible as to why it should go from 6 to 4 million euros, especially when you consider that the European Union has been increased by another 10 countries. I would just like to say that we are doing everything we can to DG agriculture to try and get an increase.

Elio RIBOLI

Thank you for your comment. I will give the last word to Professor Trakatellis.

Antonios TRAKATELLIS

I will just make a comment about globalisation. It is true that globalisation may have adverse affects in this area, but at the same time we have an increase in public awareness. I was very interested in following the story in the United States that some people are starting to show big chains like McDonald's that they are fat harbingers to which they attribute the obesity of children. As a result, McDonald's is thinking of offering some different products to the public. I know in Greece, we have a chain similar to McDonald's which offers vegetarian sandwiches and certain choices. I think globalisation has its effect, but there are counter effects today and people are very much aware. That is why I think we are at a turning point and that industry is starting to take into account the new era in the area of nutrition. This could be good, because industry is there to make money and will therefore have to change, and if this can be combined with good public health in Europe, that is even better. I think this is what we are going to see in the future

Elio RIBOLI

Thank you. We can close on this positive note that there is good hope of finding a solution that would accommodate everybody's needs.

Introduction

Adam DREWNOWSKI

University of Washington, School of Public Health and Community Medicine, Seattle, Washington, USA

This session is devoted to the topic of snacks

The first presenter is Dr Didier Chapelot. He will talk about the metabolic responses to snacks, and deal with the physiology of leptin, ghrelin and insulin. Following his presentation, Dr Jane Wardle from London will talk about children's preferences for vegetables and fruit. Following that, we will have a presentation from Dr Susan Jebb on snacking and obesity. I will close the session by introducing a new way of assessing nutritional density of foods presenting some of the joint work done by myself and Nicole Darmon from Paris. We looked at nutrient to calories ratio and the nutrient to price ratio.

So the theme of the conference will go all the way from metabolic aspects of snacking to public health to communication. I suspect we will come to the inevitable conclusion that where snacking is concerned, only vegetables and fruit are the naturally nutrient-rich snacks. We will build up in terms of science, starting with metabolism and physiology.

It is my great pleasure to introduce Dr Didier Chapelot from Paris who will talk about the metabolic responses to snacks: leptin, ghrelin and insulin.

Metabolic response to snacks: leptin, ghrelin and insulin

Didier CHAPELOT

Physiologie du Comportement Alimentaire, Université Paris 13, UFR Santé Médecine et Biologie Humaine, Bobigny, France

The title of this presentation is “Metabolic responses to snacks: leptin, ghrelin and insulin”. Paradoxically, today there is no standard definition of what is a snack. It is quite a problem because the relation of these three hormones with this eating occasion will depend on the definition of “snack”. So I will try here to examine the question of this definition.

Apparently, the situation is quite simple. To trigger the eating behaviour, the organism produces a sensation which is hunger. Then, of course, animals (and we are animals) eat when they are hungry..., or when they are not, since observation strongly suggests that sometimes eating can occur without any previous hunger cue. We can summarise this in the following sentence: all hunger signals lead to eating, but eating does not always seem to be motivated by hunger.

One of the best known examples is the cafeteria rat. When rats are provided with only chow or with a wide variety of highly palatable food items, there is a striking difference in energy intake and body weight gain. As you can imagine, the cafeteria rats become heavier than the control rats. The question is: is the rat on a cafeteria diet hungry before eating?

In a classic study, Rogers and Blundell provided rats with only bread and chocolate. They observed that food intake dramatically increased as early as the first day, and remained elevated throughout the month. As expected, there was too a very strong increase in body weight. Cafeteria rats became twofold heavier than the control groups.

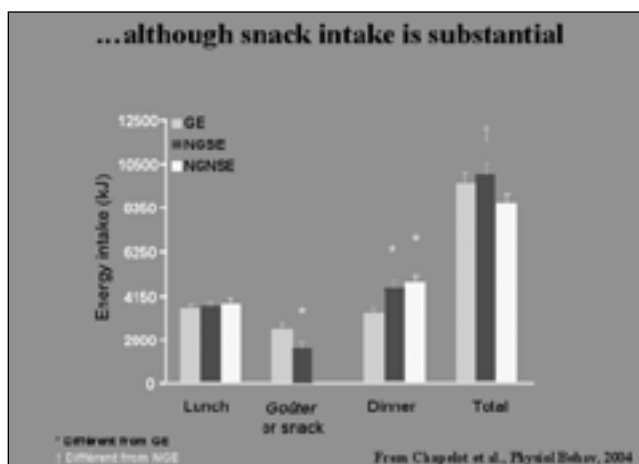
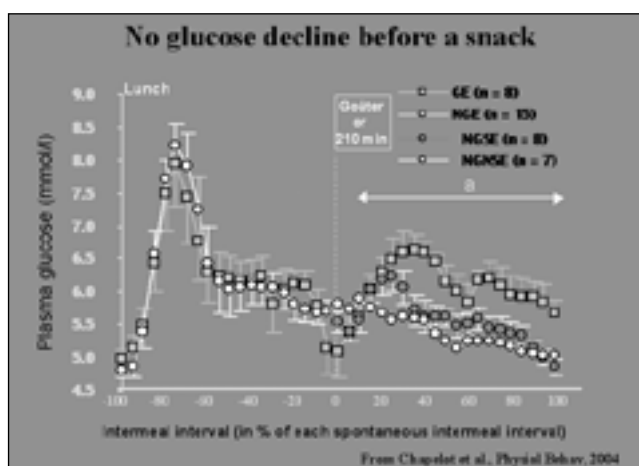
When we look at the evolution of meal size and meal frequency, we see that both become very elevated as early as the first day, suggesting that in the cafeteria rat, eating can be re-initiated during the usual satiety period. So rats may not always be hungry when they eat.

There is another very important point to be made in this study. Three months later, meal frequency became lower in the cafeteria groups than in the control group. This suggests that this supplementary eating occasion is sensitive to metabolic control. One hypothesis is that fat deposition will lead to an action on satiety, as we will see later. So in the presence of cafeteria food, eating is re-initiated during a usual satiety period. This suggests that these eating occasions are not meals and could be called snacks.

The questions are: do we really need to take into consideration whether the animal is hungry or not hungry before eating? Is this relevant to human eating behaviour?

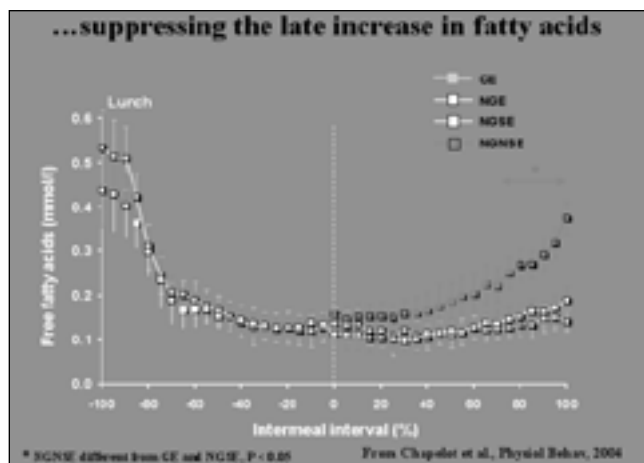
Some years ago, we showed that if biological parameters could help to discriminate between eating in a hungry state and eating in a non-hungry state, this would strongly argue for a distinctive mechanism between these two eating occasions. In particular, biology might help to assess whether the mechanisms leading to snacking are similar to usual meal eating, and whether consuming foods as a snack or as part of a meal have different consequences on further metabolism.

In 1980, Jeanine Louis-Sylvestre published a very important paper showing that before a meal there is a blood glucose decline. This profile was considered as driving hunger leading to meal intake, the meal being interrupted by satiation which relies mainly, as shown by David Booth, on sensory cues. Then you have satiety, which is determined firstly by metabolism. The causal relation between the blood glucose decline and the meal onset has received much support in humans, such as in a study by the team of Margriett Westerterp-Plantenga. On a stable baseline, a 5% decline in blood-glucose for 15-20 minutes preceded meal requests by subjects who could ask to eat whenever they wanted. So if meals are eating occasions preceded by a blood glucose decline, we have some concern about the fact that snacks can be considered as meals for some reasons. First, Campfield showed that in rats, this profile is not observed before the conception of a new highly palatable food that we can call snacks. Then, we found recently that in humans, this profile is not observed before the consumption of food during a usual satiety period.



In a study recently published, we selected two groups. One group of subjects who always eat something in the afternoon between 4 p.m. and 5.30 p.m., an eating occasion called in France the *goûter*. Another group consisted of subjects who never eat anything between lunch and dinner. In half of this second group, we presented highly palatable food that they could eat, entirely, in part or not. You will not be surprised to learn that they all ate something. This food was presented 210 minutes after lunch, the usual delay observed between lunch and *goûter* in the *goûter* eaters. We found that only usual *goûter* eaters had a blood glucose decline before this eating occasion. At lunch, energy intake was similar between groups. Then at the *goûter* period, non-*goûter* eaters ate a substantial amount of energy, but less than the *goûter* eaters. The opposite was true at dinner intake, non *goûter* eaters ate more than *goûter*-eaters. On the whole, the snack increased energy intake during the experiment. Moreover, the snack leads to only a slight rise of plasma glucose until dinner, but a dramatic insulin increase. The main consequence of this high insulin level was to suppress the usual increase in free fatty acid that we all have when we have not eaten for 6, 7 or 8 hours. Therefore, the snackers did not display any increase in free fatty acids.

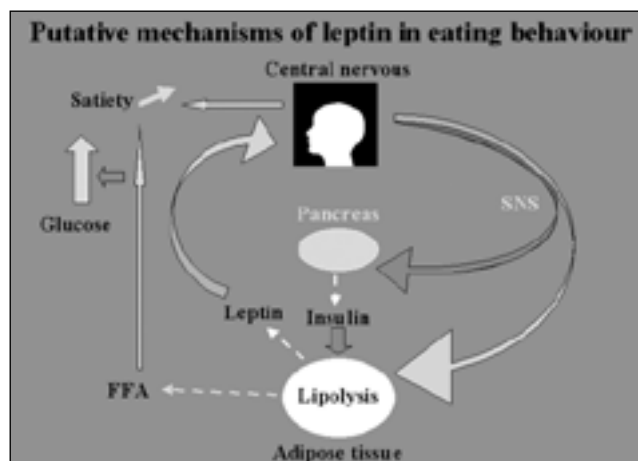
You could say that *goûter*-eaters did not show either this increase in free fatty acids, but there are arguments suggesting that when you have higher meal frequency, the metabolism relies less on fat stores. This was found in a study where the snack was mandatory and energy fixed about 1 h after lunch. We observed that the snack led to high insulin secretion and also to a reduction in free fatty acids. It is important because free fatty acids in the late part of the interval between two meals contribute to satiety in sparing glucose, and therefore in delaying the next blood-glucose decline, meaning a later meal request. Interestingly, after eating



the snack, there was no difference in the delay of dinner request. Furthermore, intake was similar in the two conditions. It was of course important to demonstrate that these free fatty acids were oxidised, and we did that some years ago. The high insulin secretion after the snack was associated with a higher respiratory quotient, which means that a smaller amount of free fatty acids was oxidised at the end of the interval.

Now, did the other blood parameters provide interesting data for understanding snacks? Not really. Thus, plasma leptin was not very different between snack-eaters and non-*goûter* eaters, except maybe that the level remained a little bit elevated until dinner. Nevertheless, there was no change in leptin levels before the *goûter* or the snack. However, leptin provided interesting information about other topics.

I will first briefly present leptin. Leptin is a hormone secreted by the adipose tissue and when the adipose tissue becomes larger, leptin is more secreted. Leptin is also considered as a satiety factor. Most of other studies cite the behavioral-mediated effect of leptin, which means that the brain leads to increased satiety. But people often forget that leptin can act in a peripheral way, firstly via the sympathetic nervous system in stimulating lipolysis, and also enhancing this effect by inhibiting insulin secretion. This leads to the release of free fatty acids by adipocytes. These free fatty acids can contribute to spare glucose via the glucose-fatty acids cycle, and therefore help to enhance satiety.



I personally think that leptin is not so much involved in satiety than in satiation. In a first study published in 2000, we found that there was an inverse relation between plasma leptin at the onset of the meal and energy intake at this meal, at lunch or dinner. This was observed in a between-subject study. In this study, we found again an inverse relation between leptin levels and consumption or energy intake at this afternoon eating occasion, whether this was a snack or a *goûter*.

Now we move to ghrelin. Ghrelin has received less support than leptin for its action in eating behaviour. However ghrelin can increase energy intake and ghrelin increases before meals. We have recently undertaken a study with David Cummings in which we observed a decrease in ghrelin after the meal and then, after 50% of the examined interval, an increase sustained until the dinner request. There was a great overlap of the hunger curve, this overlap being actually found in every subject. However, we found that some subjects did not have this late increase in ghrelin, and this is quite a problem. In the *goûter* study, there was actually an increase in ghrelin before the *goûter*. This increase was rather small but significant. In most subjects, however, ghrelin did not increase before dinner.

What is the explanation? The main explanation for this seems to be insulin. Why? Because ghrelin and leptin do not modify the model according to which insulin is the pivotal step between metabolism and eating behaviour. It is well known now that insulin and leptin are positively correlated, and we have shown with others that the relation of ghrelin to insulin is inverse. In the second study, we will publish the same inverse relation: the more insulin you have, the less ghrelin you have. And the insulin in *goûter*-eaters does not return to the baseline level before dinner.

To conclude, what can we say about leptin and ghrelin in relation to snacking? For leptin, there is no difference in the preprandial level profile between a meal and a snack, but there is a tendency

of a sustained elevation after a snack. To date, there are no studies on ghrelin and we hope to do some in the near future. This would help to answer to two questions. Do preprandial

ghrelin increases observed before the goûter occur before a snack, and does the snack-induced insulin increase lead to a decrease in ghrelin?

Questions

Adam DREWNOWSKI

My question is whether or not the metabolic impact of snacks is driven by calories alone, or does the energy density of the snack play a contributory role? On the one hand you have potato chips or a chocolate bar, for example, on the other hand you have fruit – caloric value may be the same, but the energy density would be very different. What would you say would be the metabolic consequences?

Didier CHAPELOT

Where ghrelin is concerned, the important thing is the foods and the nutrients. There is no decline in ghrelin after protein, but there is a small decline with fat and a very sizeable decline with carbohydrates. However, you cannot say that this is a good way of measuring satiety because protein provides rather high satiety, and there is nothing dealing with the relationship between snacks and ghrelin published to date. For leptin, the more carbohydrate and the more insulin you have, the more leptin you will have. The main problem with leptin that everybody should be aware of is that leptin is the "illustration" of fat mass, but during the day the profile of leptin is the illustration of what we eat. We should articulate these two phenomena and not confuse them.

Member of the audience

Do you get the same release of leptin when you get carbohydrate from fructose and glucose, or is it different?

Didier CHAPELOT

We did not perform this study, but it is clear that glucose will secrete more insulin and that you should have more leptin with glucose. I do not think the study was done. It was quite a surprise because leptin was considered as being linked to fat storage, and to see that carbohydrates are the main determinants of leptin was quite apparently paradoxical, but you should always consider insulin as doing a job.

Member of the audience

You say that snacking leads to an increase in insulin. If I remember rightly, some years ago it was shown that dividing the daily food intake into several meals, but with good compositions, leads, on the contrary, to a decrease in global insulin secretion, so the energy density in the fibre of snacks changes. Have you any comment about that?

Didier CHAPELOT

Yes. For the past two years I have been working on meal frequency and we submitted a paper that I hope we will publish in the further months, showing that if you decrease meal frequency, this leads to increased fat deposition. So this argues for the role of higher meal frequency being better than lower meal frequency. However, Jenkins had shown what you are saying and actually the pivotal relation between meal frequency and fat deposition is also insulin. I think perhaps that we can say that eating fruit and vegetables is advantageous in that it leads to slight insulin secretion.

Inaudible question

Didier CHAPELOT

That is why I asked the question. Every study on meal frequency confuses the two. So the fact is that we must in the future distinguish between "we eat 5 to 6 meals a day because we are hungry and we have done that for a long time" and "we eat 3 meals a day and we eat foods between these meals and we are not hungry when we eat these foods". This is the reason why we are working on that. As far as the question of whether there are biological distinctive parameters is concerned, I think we have shown that there are. As to whether there are differences in consequence, I think there are many.

Adam DREWNOWSKI

Now, the next presentation has everything to do with public health policy. We heard yesterday from Dr Lorelei Di Sogra that in the United States, we have a programme to distribute fruits and vegetables as snacks in schools to schoolchildren. This is costing 6 million dollars in six states at present, and we are planning to take it nationally at a cost of 42 million dollars for all the states. To take it nationally for every school in every state, the calculation was in the region of 4.5 billion dollars.

A similar programme is underway in the United Kingdom, where children in schools in lower socio-economic areas are being given fruits and vegetables as snacks. However, there was also a question from the audience yesterday from a gentleman from Milan who mentioned that he provides free fruit and vegetables to schoolchildren, but there is a lot of waste and a lot of the food comes back. So we need to know everything there is to know about the preferences of children for vegetables and fruit, because on one hand we are creating supply, but on the other we need to create demand as well, so we have to talk about both axes and the shaping of preferences.

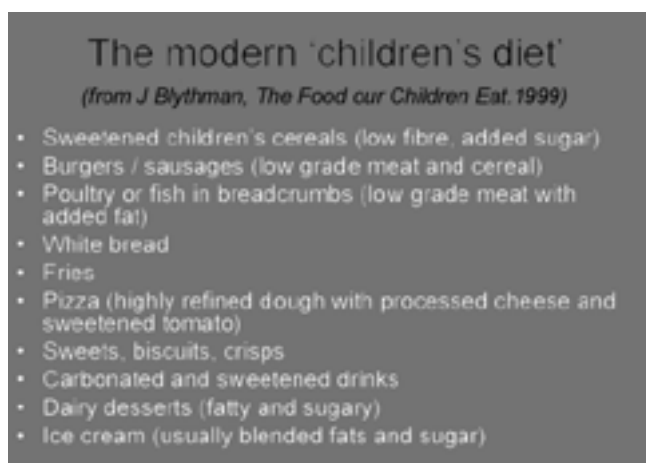
Predictors of fruit and vegetable consumption by children

Jane WARDLE

Cancer Research UK, Health Behaviour Unit, Department of Epidemiology and Public Health, University College London, London, UK

Thank you very much. I am going to talk today about understanding fruit and vegetable intake in children, and I will be talking mostly about individual differences – why one child likes them and eats them more than another.

This picture characterises the modern British child's diet, and I regret to say that many European countries are moving in this kind of direction. If you look at the sorts of things these children are eating, then it becomes apparent in a Mediterranean diet conference, that what is missing is fruit and vegetable intake.

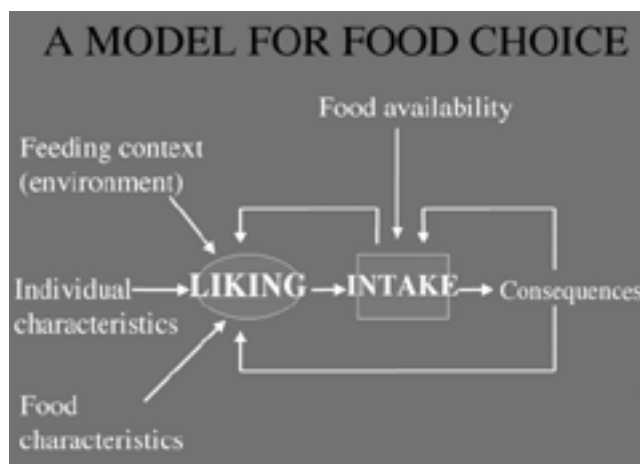


Using the same kind of measure as was mentioned by Knut Inge Klepp and other people, you can see that around a third of British children are eating fruit less than once a day, but encouragingly, you also have around a quarter or a third who are eating it more than once a day. If we could understand something about what puts people in one category rather than another, this might be helpful. The picture is similar for vegetables – again, these are missing from the diet. Around 40% of British children are eating vegetables less than once a day, and only around 15% are eating them more than once a day.

This picture shows the kind of model I have been thinking about when trying to understand children's intake of fruit and vegetables – giving 'liking' something of a priority here – and looking at characteristics of the individual, characteristics of the food, characteristics of the context – which might influence liking. This in turn has an effect on intake – and, of course, there are consequences of intake that might feed back onto some of these variables.

characteristics. These are some data from a sample of 428 four to five-year-old children looking at the proportion of children who say they do not like various kinds of foods. You can see that the outlook is bad for the vegetables. Almost 50% of British children are saying they do not like each of these fairly common vegetables. If you look at the protein foods then 10% to 20% of children – British children say they do not like these kinds of protein foods. If you look at

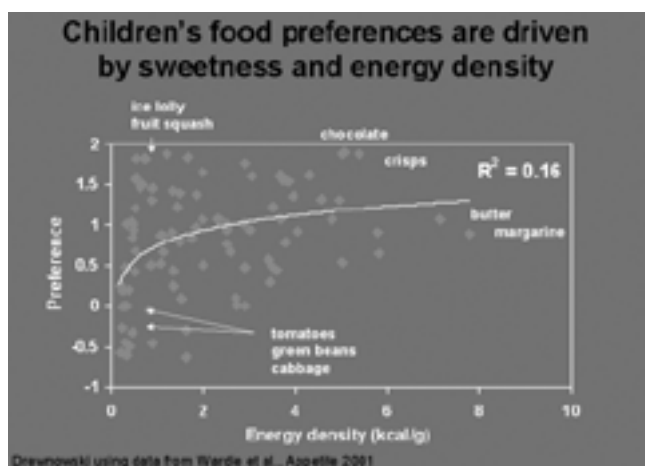
the fruit story, it is a great deal better than the vegetable story, but you still have 10% to 20% of children saying they do not like each of a number of fruits. The only foods that come out well are the starchy, sweet and high fat foods, where you have almost no children disliking the majority of these foods.



What about the characteristics of the food which might influence preferences? One thing that is well established is flavour. Sweet foods tend to be innately more liked, and bitter and sour foods innately more disliked. I used my colleague Leigh Gibson's two-week-old son just to demonstrate children's reactions to sour foods. This is little Thomas Gibson, aged two weeks, who had always been breast fed. Here he is being given his first taste of water, and you can see he looks interested in tasting the water. Here he is being given his first taste of sucrose solution, and he is licking his lips very cheerfully. Here he is being given a taste of lemon juice, and he reflects the two week old child's resistance to this kind of taste.

As Adam mentioned, we have also been interested in energy density as an influence on food liking. Adam himself conducted some analyses on our children's food preferences, looking at the relationship between the energy density of various different kinds of foods and the liking for those different kinds of foods in children. By reanalysing our data, he showed that fruit and vegetable foods, which are relatively low in energy density, come right down here at the low end of the preference scale. Up at the top end of energy density and preference are the high fat, salty, sweet snack foods.

We have done the same analysis specifically within fruits and vegetables and interestingly, you still see the same kind of effect. It is drawn the other way round here, so we have energy density, liking for food and all the fruits and vegetables which were in our analyses represented on here. So at the top are the relatively more energy dense fruits and vegetables which are better liked, and down at the bottom end you have the fruits and vegetables which are lower in energy density. These children typically describe themselves as not liking.



So we could conclude from these results that part of the reason why intake of vegetables is likely to be low is that the low sweetness, low energy density and, for some of them, the higher bitterness, will all tend towards producing lower liking. Intake of fruits may also be low because of relatively low energy density: although some fruits are sweet, not all fruits taste very sweet, so we have relatively low sweetness, especially compared with the sweet snacks that are available and higher sourness leading to lower liking. What is more, fruits and vegetables are frequently offered to children as an alternative to very high fat, very high energy dense foods, and we know from other studies that that a more preferred alternative can influence preferences for the target food.

I will now move on and give you a little data from our studies on looking at the feeding context – the environment that parents provide for children – and looking at how that might influence fruit and vegetable intake. I am looking at three groups of characteristics: availability and modelling in the home, exposure and reward, and health claims which parents might make for the foods they're offering the children in the home.

One of the things that tend to be true within the home is that foods that are in the home are those that parents have chosen to eat. These are foods that are provided there for the children, so that food being available and food being modelled as being eaten by parents tend to go together. This is an analysis from a community sample of 564 3 to 5-year-old (nursery age) children, in which parents completed a questionnaire about their children's fruit and vegetable intake, their own fruit and vegetable intake, and a whole number of other characteristics about the child. However, what you see here and what comes out in study after study is that parental intake is invariably the strongest correlate. These are just univariate correlations but it comes out just as strongly if you use multivariate analyses. So what the parents are doing, which reflects both what they model to their child and availability in the home, is a powerful determinant of what the children are going to eat.

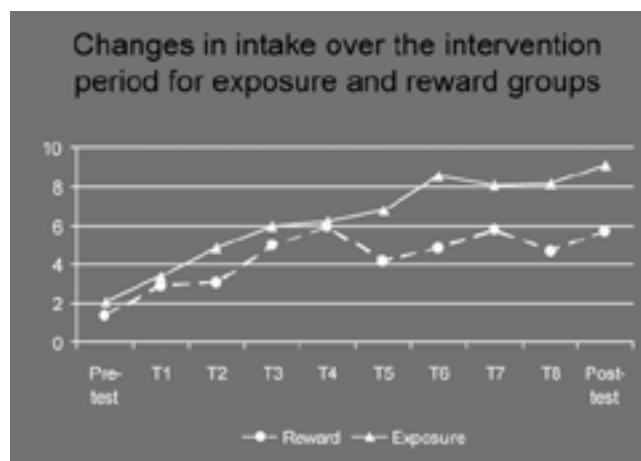
We have also been looking at children being specifically exposed to foods. The first study I did was a small study of children in primary schools, in which I compared getting them to have little tastes of a vegetable they did not like with being given little tastes and promised a reward for these kinds of foods. I looked at the effect over a week, either of daily exposure over eight days (exposure group), daily exposure with a reward over eight days (reward group), or no exposure (control group). We used red pepper. I do lots of studies using red pepper in England because raw red pepper is a convenient food, it is a food that British children do not like very much, do not have very much, and it is

one you can easily cut into little pieces.

Each day the children were asked if they would like a tiny taste of the food and you see a steady increase in intake over the days. Compared with the control group, in the exposure group, you have a dramatic increase in liking for the food over the exposure period. There is a significant increase compared with the control group. The group that has exposure also shows a big increase in the amount of food they are prepared to eat at the end of the exposure period, so we can show that daily exposures both increased intake and liking compared with the no treatment group.

We were also interested in what happened if we said "if you eat this you can have a reward". These were our observations in the reward group. You can see that promise of a reward also increases intake of vegetables over the time period but interestingly, not quite as strongly as in the non-rewarded group. If you look at the change in liking from start to finish, then the reward group comes out intermediate between the exposure group and the control group. The phenomenon is the same for intake: the control group increases a little bit, the reward group increases a little more and the exposure group increases more. To summarise these results, this indicates that this exposure-based intervention can both increase liking and consumption. The finding that the reward group comes in between 'exposure' and 'control' suggests that somehow reward may limit the effectiveness of exposure. The model that we assume is in action here is that the children think "if they have to offer me a reward to do this, then maybe it isn't all it's cracked up to be".

We then wanted to see whether we could get the same kind of effect of an improvement in liking and intake if we asked the parents to do this exposure procedure – after all, it will be the parents that will do this in real life if it is going to be of any use. We explained to the parents that we wanted them to give the children tiny tastes of the food every day for two consecutive weeks, and then we tested the children's intake and liking of the food in the lab before and after they had done this. We did not use a reward condition in this, but we used a control condition in which parents were given a leaflet about healthy eating and encouraged on the importance of getting their children to eat more fruits and vegetables. You can see what happens here as a consequence of the parents doing two weeks of this daily exposure. You get a small increase in liking in the control groups, you get a bigger increase in the children's liking for the vegetable which they had been doing the taste exposure on in the children that had exposure. If you gave the parents a healthy eating leaflet, it actually seemed to make things slightly worse. You get the same kind of pattern of results if you look at changes in intake in our taste test before and after, rather than just changes in liking.



I would like to mention one other thing relating to what parents might do within the home – and anybody who is a parent here will have done this – which is to make a health claim to your child, for example you say “this will be good for you”. Some years ago we conducted a little experiment on the effects of making health claims to children about the food they were being given to eat. These children were presented with a novel drink – this was not a fruit and vegetable study, it was a fruit drink that children were told we were testing for possible marketing. All the children got the same drink, but half of them were told it was just a new drink we were testing out, and the other half were told it was a new health drink that we were testing out. We measured whether they liked the taste of it, whether they wanted their mother to buy it for them, and whether they would suggest to their friends that it was something nice to drink. You can see here that all you need do is tell children that something is good for them and you can diminish their liking for it.

Lastly, I want to move on to individual characteristics, i.e. the features of the individual that might influence behaviour. One of the things we noticed very strongly when we talked to parents is that they will say things such as “one of my children has always liked vegetables a lot but the other doesn’t like them very much”, and there tends to be quite a strong assumption in parents’ heads that these characteristics – liking or affective responses to food – are innate or predetermined and possibly unchangeable. So one of the things that we have been interested in looking at is how much difference there is between individuals in their liking and what kinds of explanations there might be for it.

The first bit of data I am going to talk to you about is the heritability of food preferences. People have been trying to see how heritable food preferences are for rather a long time, but for the most part they used fairly small studies and a rather arbitrary and small selection of foods which they work on. We used twin data from the same data that I showed you earlier. I am sure you are all aware that you can use twin data to assess the heritability of things. If food preferences are heritable, we would expect likes and dislikes to be much more similar in identical twins, who are obviously genetically identical, than in non-identical twins, who only on average share half of their genes.

So these are results from 214 same-sex twin pairs. Half of the twins are MZ pairs and half are DZ pairs. Representing the correlations between the twins are the blue bars for the DZ pairs, the non-identical twins, and the green bars for the identical twins. What you can see is that twins are quite similar, as you often find in the case of siblings. They are all fairly similar in their food preferences, but for all of these food types the MZ twins come out as slightly more similar than the DZ. I should say that what we did was group all of our foods into dessert foods, meat and fish foods, fruit foods and vegetable foods for these analyses, so we are averaging across a lot of food preferences. Then you can use modelling techniques to estimate the heritability. What you see here is some interesting variability between foods, so the liking for these protein foods comes out as significantly more heritable than for any of the other food types. Parents are often quite certain that vegetable liking represents an innate and unchangeable characteristic. But we only have 30% heritability for vegetables. The figure is slightly higher at 50% for fruits, and is very low indeed for dessert foods. So we have evidence for slight heritability but the majority of the variation is environmentally caused variation. Although I do not have the data here to show you, in fact almost all of that is shared environment effect, so these are things that are going on in the home that explain variation.

The other characteristic we have been interested in is child temperament, and particularly the phenomenon of being a picky

eater. Anyone here who has children will know about these picky eaters who say they do not like all sorts of things. We found that about 10% to 20% of parents will describe one of their children as being a picky eater. There are a number of different ways of assessing it, but one that has been most widely used is the measurement of something called neophobia – fear of new food – which typically emerges somewhere between the ages of 18 months and 2 years and manifests itself as avoidance of and reluctance to eat unfamiliar things. It is particularly frustrating for parents when the child says “I won’t try it but I know I don’t like it.” We used Patricia Pliner’s food neophobia scale for these data and this is the same community sample that I showed you before. These results show the relationship between children’s scores on the neophobia scale and the frequency of their consumption of a whole lot of different food types. One thing you see interestingly is that neophobia is much more strongly related to vegetable intake than to any of the other foods, so if you have a child who has this temperamental reluctance to eat new things, one of the things that will come out strongly in this is vegetables. Fruit is also quite strong, meat is relatively strong, but no neophobic child says “thanks, but no thanks, I won’t like this new chocolate; I’m not going to try it.” So when it comes to sweets, which are high energy dense, your neophobic child will just pop it in its mouth and give it a try. It is not the same for a new leaf they have never seen before.

The last bit of data I am going to show you is concerned with looking at the relationship between the children’s school neophobia and what they ate when we gave them a series of test meals at school. The previous data had been based on what parents said about what their kids would like and eat, but we wanted to see if neophobia still predicted what children would eat when we measured what they eat. So the measurements were taken in school and the children each had their lunch in a little dish which had all the different food components in it. We weighed and measured each child’s meal tray before and after. They had protein foods, some fruits and vegetables, some starchy foods, and some fatty and sugary foods. Interestingly, you see the same kind of effect here. In terms of the volume of intake of fruits and vegetables, you saw a strong relationship with the neophobia score, likewise for the protein based foods, but there was no correlation whatever between children’s neophobia and their consumption of these other two kinds of foods.

To sum up what I have been telling you about influences on children’s fruit and vegetable intake, these are the things which I think may be important influences which can make a difference between consumption and refusal, and liking and disliking. Sweetness and energy density of the food is obviously a major determinant, but the food environment and parental intake are also very important. The kinds of strategies that parents use – bribing, arguing and making health claims which are the typical things parents do – are all having adverse effects. Children do have inherited taste preferences and differences in their preferences, some will like fruits and vegetables more than others, and in particular this neophobic characteristic will make a difference.

However, if you want to get your kids to eat their vegetables, these would be my recommendations. First of all, have faith. Humans can learn to like everything that does not actually make them sick. Secondly, create familiarity. Start them young and repeat these novel tastes at least 10 times before you give up. Get good models in the child’s environment. Give them the opportunity to see others eating a wide range of foods – do not have your kids eating on their own separately from parents and others in the home. Be very careful with rewards and equally careful with health claims – do not use this as your major weapons in controlling children’s food intakes.

Questions

Didier CHAPELOT

With regard to the information, do not you think it would be important in the future to separate only the claim 'this is good for you', that 'this is healthy', and to provide a small and easy explanation? Do not you think that a little explanation will help to increase the effect of the information?

Jane WARDLE

I was slightly playing to effect there in terms of the health claims and I do think that once children reach an age of having some intelligence, they are susceptible to getting some kind of health information about food. So I agree with you, I do not think we should regard giving children information as a completely unacceptable way to influence them. In the end, they do need to know these things and they do need to make their own decisions. I think particularly though when children are smaller – we were looking at 3 to 5-year-olds and 5 to 7-year-olds – to start telling the children that the food is good for them may carry this rather specific message. The reason I think that is that the children learn over time that their parents only bring up this 'good for you' story when the child is already not wanting to eat the food, so that it actually becomes paired in the child's experience with something that is not very desirable.

Lorelei DI SOGRA

Jane, thank you for your excellent presentation. In our experience over many years providing fruit and vegetable snacks in schools – not just within the scope of the programme that is going on right now, but with children in the 3rd grade (7 to 8-year-olds), who are older than some of the children in your study – we found that just putting the fruit and vegetables out as a snack without any pressure, without any health messages, putting a wide variety out at snack time and making it fun led to a very high consumption during snack time of many servings. It was a case of the whole social environment being fun and just making them available.

Jane WARDLE

I think that is right, and certainly, other people have already presented data during this meeting showing that children do not see themselves as having very high access to fruit a lot of the time. Also, when fruit is accessible to children, there is often an implicit alternative. I think in some of these school fruit studies, one of the attractions is that you are not having fruit on one table and cookies on the next and asking which they would like, you are just providing them with fruit or vegetables.

Member of the audience

First of all, I am representing the fruit industry. The problem we have always borne in mind is this: when you have a headache you reach for the aspirin, so if you are not feeling well and we have an association with bananas or whatever, it can be very dangerous to make health claims in terms of fruit. This is just a general comment.

My other comment is that in working in Ireland with the food dude scheme and Professor Fergus Lowe, we found that rewards have been very helpful in cracking peer pressure in the playground. Maybe it is the psychology there that, given free access to fruit and vegetables, the kids will eat them and eat them more, but there are always a certain number of cool dudes in the playground who are called rabbits if they eat lettuce. It can be a good idea if they crack, then the rest of the class goes and you have got them on your side.

Jane WARDLE

I think that is absolutely right and Leanne Birch has also shown that same-age peer models would be effective. I think all the social psychology we know would suggest that if the peer models are cool peers and not nerdy peers, then maybe you get an even better result.

Member of the audience

Jane, I cannot thank you enough for your research here. I am so delighted to learn what you have been doing and I think we have been looking for it for a long time. Now I will go back and try to implement some of your wonderful results immediately.

At the end of your presentation, you mentioned that you might also go into limiting access to the bad stuff as part of your strategy. Let me just give you a new hint (I am talking on a personal level here): with my kids, we serve cup of fruits and vegetables, exactly at the moment when they are very hungry in the hours before we eat – they just have fruit lying in front of the television. This way of timing it to when the kids are actually very hungry is a very easy way to control what they are eating. Thank you.

Jane WARDLE

That is a very interesting point about timing and we have actually done a study looking at whether you can improve people's desire for fruit by feeding it to them at a time when they are very hungry compared with a time at which they are less hungry. Because it was based on some other work we had done, we reasoned that given that fruit and vegetables have a relatively low energy density, choosing a time when the person was hungry you would see a more visible change in their energy response to it and that would be a plus. In fact, the results were not very good. One of the things we discovered (and maybe we used a time when they were too hungry) is that if people are very hungry, then they do not want fruit. In fact, fruit seems undesirable and the effect of eating a small bit of apple when you are very hungry is to make you want a biscuit even more than you wanted it before you had eaten the apple. I definitely think this is something to look at a bit more – whether you can position fruit at a time of day in the diet which will maximise the learning of the pleasurable consequences of it.

Member of the audience

First of all, a comment that may be a little facetious. You are saying that rewards do not produce any success, but you tell children not to smoke and not to drink, they pretty soon want to try it out. Perhaps we should be telling them not to eat fruit and vegetables

and make out that they are adult foods, perhaps they would then desire them as part of a culturation process. That is slightly facetious but there may be some benefit from that.

Jane WARDLE

Interestingly, children do like some of the “treat” fruits, and they seem to like relatively more fruits which they are not allowed freely. In Britain, strawberries are special – you can only have a small number of them and only occasionally – and children tend to rate those relatively more highly.

I think we showed that reward had an intermediate effect between no exposure and exposure. I am not saying that reward is necessarily a bad thing to do but I think it may carry an implicit message which limits the benefit from having repeated exposure towards greater acceptance of the food.

The previous member of the audience

In the North East of Scotland, we have an intervention in primary schools which involves disguising the fruit and vegetables by using energy-dense additions and making fruit smoothies using yoghurt or ice cream, and these are highly acceptable to the children. I wondered if you felt that using the energy dense foods to disguise was a way forward.

Jane WARDLE

Well, it has been studied very little. There was a brief period in which one of the frozen food manufacturers in England, producing chocolate-covered carrots and that sort of thing, which I think did not go down very well. If you look at cookery books and recipes and parent child-feeding books from 50 years or so ago, you see that the dessert was almost always a starch-fruit combination, including fruit pies and fruit desserts of various sorts. Certainly, in the British diet, these were very normal and actually seem to have disappeared from the repertoire. It may be that the effect of mixing low energy dense tastes with some high energy dense tastes could be a beneficial approach, so I think that is a very interesting approach.

Adam DREWNOWSKI

Thank you, Jane. We will move on to the next presentation. I think the question we had about the timing of the snacks and the consumption at various states of hunger leads us perfectly to our next presentation. There has been a great deal of controversy about the satiating value of different foods. People are asking whether or not fast foods have less satiating power than the alternatives, and whether or not we have liquid and beverages as our satiating power. In some of our studies, however, we found that what really makes the difference is not so much the physical nature of the snack, but exactly at what point during the day it is consumed. So the frequency of snacking and the timing of the snack may be the factor that links food consumption to obesity and overweight.

Snacking and obesity

Susan JEBB

MRC Human Nutrition Research, Elsie Widdowson Laboratory, Cambridge, UK

Introduction

This talk will focus on the issue of snacking and obesity and in particular on the kinds of foods and drinks commonly described as snacks. The Mediterranean diet is usually characterised by particular types of foods or certain dietary patterns. It is often forgotten that Mediterranean diet also emphasises food and meals that are freshly prepared and eaten in a very sociable context. That contrasts with an increasing trend in Britain and elsewhere for people to eat individually, perhaps just re-heating food in a microwave, or grazing on snack items. Family eating occasions in Britain are increasingly likely to be centred around the television than the dining table.

Methodological issues

One of the problems of research in this area is to define what is meant by a snack. Most people have a personal view, but it is not easily defined in a standardised methodological framework. Is it a food which is just simple and easy to consume or can be eaten very fast? This would include fruit or chocolate. But it might also include microwavable ready-meals or sandwiches depending on the timing. Are these a snack if they are eaten between regular meals, whereas a meal if they are consumed at lunchtime? Or is the defining characteristic about portion size? At what stage does the size of an item define it as a meal? There is huge confusion. Certain foods, for example, ice cream may be eaten as a dessert at the end of a meal or as a snack in the middle of the afternoon. All of these possible interpretations make it very hard in dietary surveys to define what is a snack and hence to determine its relationship with obesity.

Epidemiology is often the starting point for diet-disease relationships. However, few surveys characterise snacking very precisely and additionally there is the issue of under-reporting. On average dietary surveys fail to capture about 25% of total energy and under-reporting in obese people is more likely to represent 30% or 40% of total energy, immediately introducing a bias into analyses of diet and obesity.

A number of studies have sought to define snacking in terms of eating frequency. Here there may also be post-hoc effects because many obese people may skip meals or eating episodes in an attempt to control their weight. The net effect is that in most cross-sectional analyses, the number of eating episode is inversely related to body mass index or the prevalence of obesity.

The problem with under-reporting is illustrated in data taken from the NHANES (Figure 1) survey which appears to show a positive relationship between eating frequency and BMI. However, in each category of eating episodes there is evidence of significant under-reporting and the degree of under-reporting is related to the number of reported eating episodes. So, epidemiology is a very unreliable ally in these studies of snacking and obesity.

Snacking and energy balance

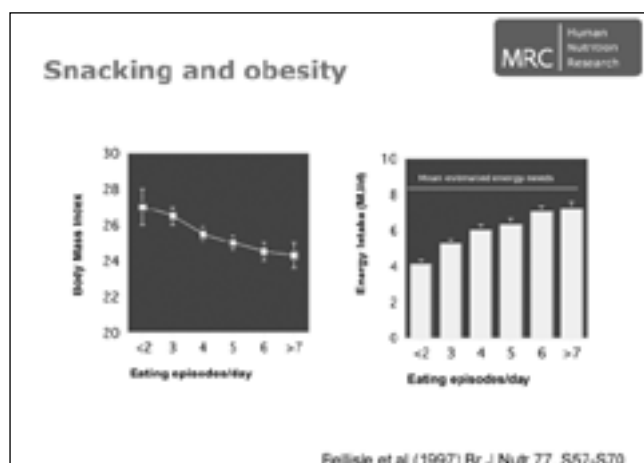
If snacking is linked to body weight regulation, it must be mediated either through energy intake or energy expenditure. Data on energy expenditure in highly controlled experimental studies, usually in whole body calorimeters, shows no effect of eating frequency. Whether you have a small number of eating episodes, perhaps two or three, compared to a very large number, six, seven or even more, there is no difference in net energy expenditure when subjects are fed iso-energetic diets. The effect on intake is more difficult to study. However, preloads which may be considered as a pre-meal snack, show differential effects on subsequent intake depending on the time interval. When consumed very shortly before a meal (30 minutes) there is actually relatively good compensation, while a pre-load or snack consumed 90 minutes or more before a meal results in poor compensation and excess energy intake in total. This suggests that snacks consumed outside traditional meal periods may be associated with an increased risk of over-consumption.

However, the pre-load paradigm usually refers to a single meal or at most intake over a single day. In a longer term study where subjects were given four different kinds of snacks, high or low fat and sweet or savoury, and each was offered for a three-week period, total energy intake was not significantly different across any of the treatments. This suggests that there was good compensation for the imposed snacks.

Concern about snacking has increased in part because there is a secular trend towards a greater proportion of total energy intake being derived from snacks. Data from the CSFII in the USA shows that the increase in the contribution from snacks essentially accounts for the overall increase in energy intake. Between 1977-78 and 1994-96 the number of snacking occasions has increased significantly and the calories per snack have increased, possibly reflecting increases in portion size. There has also been an increase in the energy density of snacks being consumed, reflecting the fact that people are not tending to snack on fruit and vegetables but on much more energy dense items.

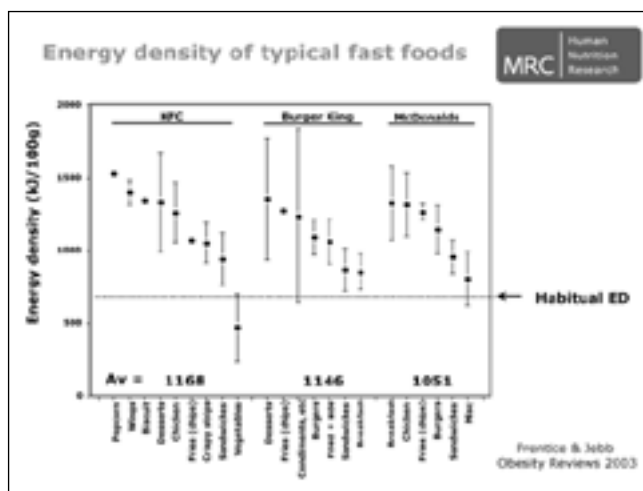
Energy Density

It is now well established that as energy density increases there is an increase in ad libitum energy intake because people fail to down regulate the amount of food they consume to compensate for the increased energy density. A small error in the weight of a low energy dense food consumed has little impact on total energy intake. You can double or halve the portion size for low energy dense food like vegetables with very little consequence for energy intake. In contrast, even a minor error in the assessment of the appropriate portion size for high energy dense food, will have very significant consequences for total energy intakes. Even an extra bite or two of an energy dense food adds a considerable number of calories. Energy dense



foods really do matter in the control of obesity and perhaps one of the most energy dense foods in our diet or groups of food are fast foods.

Fast food may be consumed either as a meal or a snack and has all characteristics of energy dense food: high in fat and/or high in added sugars, low in fruit and vegetables and often very dry foods, or with relatively low water content. We have compared the energy density of the entire menu range as available in fast food outlets in 2002 with the habitual UK diet (Figure 2). This analysis shows that the average energy density of the items available in fast food outlets is much higher than the habitual UK diet, and more than twice the energy density of food habitually consumed by people with a relatively healthy diet (defined as less than 35% energy from fat and more than 400g of fruit and vegetables per day). Traditional fast foods (burgers, fried chicken, pizza etc) have a tremendously high energy density, although it is notable that in recent years we are seeing some diversification in the menu options at many of these restaurants including some options with lower energy density. This variety is to be welcomed but puts a responsibility on the consumer to make the healthier choice.



This high energy density does seem to matter for body weight. Data from a study in adolescents shows that on those days in which they consumed fast food, obese adolescents had a significantly higher energy intake than on those days when they did not consume fast foods. However energy intake was unchanged in the lean subject regardless of whether fast food was consumed. This reinforces the idea that there are some people who appear to have good appetite control systems. We are all living in the same world, yet some people manage to regulate their energy intake and balance their body weight even in the face of fast food restaurants and other eating opportunities. We need to focus much more on the inter-individual variability in response to environmental clues in studies of the aetiology of obesity.

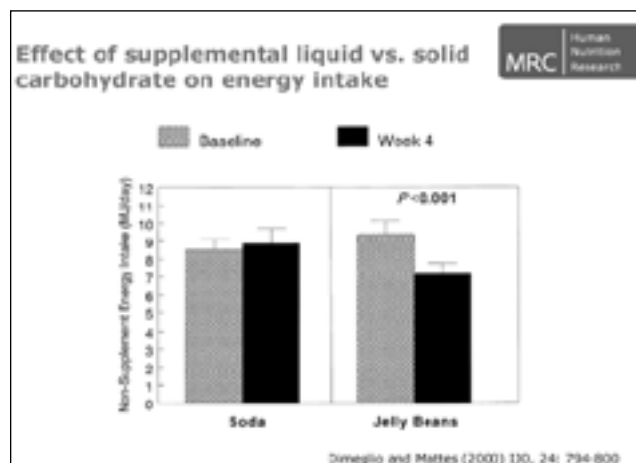
These experimental studies are complemented by a recent large epidemiological analysis which shows links between fast food consumption and obesity. Figure 3 shows data from the CARDIA study which suggests that regular fast food consumption over prolonged periods of time is associated with an increased risk of weight gain and also type 2 diabetes. Together these diverse strands of evidence provide a strong case that fast food, as a particular kind of snack, is linked to an increased risk of obesity.



Soft drinks

When considering energy density, it is very important to exclude beverages from the analysis. Drinks have a very high water content and as a result a rather low energy density. They impact on the body's appetite control system in a quite different way from solid food. There is now growing evidence that the increase in soft drinks, commonly consumed as a snack, may be linked with an increased risk of obesity. It is always very difficult in obesity to find a single clear convincing study which directly associates any one specific food with a particular outcome. However, there is now evidence from ecological studies, looking at secular trends, cross-sectional analyses showing an increased risk of obesity with increases in drink consumption, together with more mechanistic studies which have looked at appetite control in laboratory situations and have shown that drinks have low satiating properties.

Figure 4 illustrates the point why the energy contribution from beverages must be considered quite separately from that for solid foods. People were provided with the same number of calories either as a soda drink or as solid jelly beans. With the jelly bean treatment ad libitum energy intake was significantly decreased, just about sufficient to counter balance the added calories from the sweets. But this was not the case in the soda treatment where energy intake from other foods was unaltered. The additional calories from the drink essentially slipped into the diet apparently unnoticed. This and other studies suggest that sugar-rich drinks tend to supplement, rather than substitute, for other components of the diet.



However the strongest evidence that soft drinks are a risk factor for obesity comes from intervention studies. Astrup's group have shown that over just ten weeks people provided with artificially sweetened versus sugar-rich drinks showed significant

differences in body weight trajectories with modest weight loss in the low sugar group versus weight gain in the sugar-rich group. In the UK a “Ditch The Fizz” study done in schools over the course of one year advised children to decrease their consumption of sugar-rich drinks as part of a more generalised healthy eating message. There was no significant change in the prevalence of overweight in the intervention schools, but this contrasted sharply with a marked increase in the control group schools. This preliminary study points towards an important area for future research.

These studies highlight that it is the type of food or drink that is chosen as a snack which makes the difference to weight. There is no evidence that people snacking on the light or diet versions of these drinks are at an increased risk, but there is growing evidence that the sugar-rich varieties may be detrimental to body weight.

Summary

There are no simple or straightforward answers to the question “does snacking lead to obesity?”. We need to perhaps consider if this is the most useful question to ask. Is snacking itself the root of the problem or is it just a manifestation of a whole cluster of other behaviours. Is snacking acting as a marker of an overall

lifestyle? Is snacking, particularly in children, a measure of a broader family environment (the microenvironment) in which these children live? Physical activity is also an important confounder and we need far more research on the interactions between dietary habits and physical activity. We have done some very preliminary work in this area using the UK National Dietary Surveys and we can see that those children who spend the most time in sedentary activities are also those who consume the greatest quantity of savoury snacks and the least fruit.

In conclusion, at present there is actually no consistent evidence that there is any link between eating frequency per se and obesity. However, many of the analyses are confounded by reporting errors and have not adequately considered the impact of things such as physical activity. Nevertheless there is good evidence that the type of food or drink that people often choose to consume as a snack is very important and may be a marker of broader cultural or social or individual habits, which link to obesity.

I am left to conclude that meal eating may be an aspect of the Mediterranean diet that warrants greater attention. We are perhaps focusing too much on the nutrients or foods rather than the context in which that food is consumed when considering the impact on health.

Questions

Didier CHAPELOT

As you imagine, I do not agree with some points. The first point is energy density. I am sorry to say that I do not really believe the importance of energy density. Can you show that you must eliminate soft beverages to describe the effect of energy density? You know that soft beverages lower the energy density. You know that populations in the past had a very high energy density diet but did not show any obesity. The main characteristic is that when you have high energy density because you have high fat content, you have low carbohydrate and low insulin. Here in our occidental countries we do not have very high energy density; we have carbohydrate and fat and rather high energy density.

I do not agree at all with you about the meal frequency. The studies of the last 30 years are not valid because they do not discriminate between snacks and meals. They say they do not discriminate and they conclude that there are no data in favour of meal frequency, but that there is lower adiposity with higher meal frequency. There was a very important study conducted by Fabry in the 1960s. In intervention studies in three schools it was clearly demonstrated that the school with the lower meal frequency had a higher adiposity at the end of the year, and the school with the higher meal frequency had lower adiposity. In the study we carried out two years ago, we found that with a decrease in meal frequency. So I cannot really say that I can conclude that meal frequency has no link with obesity.

Susan JEBB

Let me take your last point first. I was not concluding that meal frequency does not impact on obesity, I was concluding that the data was very inconsistent and that if we rely just on epidemiology, I do not think we can draw a clear conclusion. You are absolutely right, there are some studies which do show an effect, but many others which do not. I think the methodological issues I referred to including the poor definition of a snack and under-reporting are hard to get around, so I do not think we are going to resolve this just through epidemiology.

We have heard a lot about energy density in this meeting and I do not want to start unpacking the whole argument about whether this is, or is not, a useful way of describing the risk of obesity with certain foods. I think it is methodologically unfortunate that we have to take soft drinks or beverages out of it; it makes for an untidy analysis. However, I think there is now a wealth of experimental data which tells us that the energy density of the solid food component of the meal is a very important determinant of total energy intake. It is not the only determinant, it just happens to be one which explains, I believe, quite a significant proportion of the variability in ad libitum consumption.

Didier CHAPELOT

The difference is between epidemiological studies and intervention studies, that is what Fabry's study was based on.

Barbara ROLLS

I agree with Susan that there is no single explanation of the regulation of food intake. We know protein probably is more satiating than the other macro-nutrients. However, having spent many years working on human food intake, the effects of energy density are absolutely the most robust and convincing, apart from perhaps portion size effects; you just cannot fail to find effects of energy density of foods on food intake.

Susan JEBB

I think the other point to rise is that I have very purposely kept off the issues of meal frequency and the impact on hormones, on insulin, leptin and so on. One can make a case that more frequent meals may have some beneficial effects. When we are considering advice to the public, I think we have to take a much more holistic view rather than just focusing on obesity per se, because at the end of the day, what we want to do is to reduce metabolic risk. Obesity is part of that, but it is not the whole story, and that I think is another reason why it becomes very difficult to make concrete conclusions and advise people about what they should do in terms of eating frequency. I firmly believe that it is the type and total amount of food that people are consuming whether this is all at those episodes, be those episodes 2, 3, 6 or 7 episodes.

Barbara ROLLS

I wanted to just comment on what is happening in the fast food industry in the States. Adam and I have heard a lot from fast food companies recently at the FTA mandated meeting. Interestingly, McDonald's, for the first time ever, presented a scientific poster at Experimental Biology, our biggest biological meeting in the States. Looking at the energy density of their menus, overall from the 1970s to current times, the energy density of their menu has gone down, primarily because of the introduction of the salads and the apple slices, and they have some fruit parfaits now. I am not convinced they looked optimally at energy density – they did not really tweak it the way we would have done – but nevertheless, they are encouraged now to keep introducing fruit and vegetables into their menus. They told us about the barriers that they face: they are now the biggest purchasers of apples because of the apple slices on their menus. If they decide to introduce anything on their menu, even one additional lettuce leaf to a burger, they have to start planning years in advance to grow the lettuce or whatever, so they are trying. I am not defending them; I am just saying what they are doing. It is going to take a long time; they know what they need to be doing and the great thing is that people are buying the fruits and vegetables.

Susan JEBB

The same is happening in Europe and I have had very similar discussions. I think we have to recognise that then puts a huge responsibility on the consumer to make the right choice. Whilst we would all argue that more choice is generally a good thing, choice without the understanding of the implications of that choice is a very significant responsibility, and I think that makes fast food a high risk choice for many consumers who are at risk of obesity.

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

Adam DREWNOWSKI

University of Washington, School of Public Health and Community Medicine, Seattle, Washington, USA

In my presentation I will attempt a synthesis of what has gone on before and take you in a different direction. In this particular session, we started by talking about metabolic responses to snacks; then we went on to discuss food preferences and lifestyles and right now, we are moving on to discuss public policy implications of communicating nutritional knowledge to the consumer.

I am going to be talking about nutrient density as a tool for health promotion. I am going to be introducing the naturally nutrient rich index. I will also describe the thinking behind what are 'naturally nutrient rich foods' and what are 'naturally nutrient rich snacks'.

Obesity and the food environment: Science has many answers	
Eating too much	Walking too little
Fat	Sugar or starch
Sucrose	High fructose corn syrup
Sugar	Noncaloric sweeteners
Liquid beverages	Energy dense (solid) foods
Eating in restaurants	Eating at home
Large meals	Between-meal snacks
Fast foods	Vending machines
Gluttony	Sloth

Let us take a little detour here into obesity literature. For the past two days we have been hearing about the various reasons for the obesity epidemic. Science, as usual, has many answers. It is never a single answer. We have papers in the scientific literature saying it is the fat, the sugar, the soft drinks, the fast foods, it is eating in restaurants, eating at home, it is all of those things. So I put together a slide giving various types of reasons for the obesity epidemic. One reason, of course, is eating too much. Another is walking too little. People have blamed fat content of the diet, but they have also blamed sugar and starch. Sucrose has come under scrutiny, but so has high fructose corn syrup. Although we are blaming sugar, there is a paper in literature saying that it is intense sweeteners that actually lead to obesity. We have heard about liquid beverages, but also about energy dense solid foods. Eating in restaurants and, of course, eating at home. Large meals, in-between meal snacks, fast foods and vending machines have all been blamed. There is also the classic paper by Susan Jebb blaming gluttony and my favourite, sloth.

So we have all those various dietary possibilities. The new theme I want to introduce is the following: the unwelcome truth is that for many people, obesity is the social cost of global economic policies. And as a result the exhortations to change individual behaviour are not really going to work, especially for the most disadvantaged groups. We need to have a coherent set of government or international policies with which we structure our diet from both the standpoint of behaviour and also food accessibility and affordability. The point about energy dense foods is they are cheap. When it comes to competing for

consumer attention in terms of calories per dollar or in terms of calories per euro, nothing really competes with sugar. The cost of producing 1 pound of sugar in Brazil is as little as 4 cents per pound, which means that you are getting close to 50 000 calories for one dollar. Nothing comes close.

So the question is, why will people not eat better diets? The unfortunate answer is that in many cases, healthier diets cost more. So although we have been talking about the food industry – the fast foods, the snacks, the chocolate, the soft drinks – there is one other possible answer that we should be keeping in mind: it is not necessarily the junk foods, it may be the junk wages.

The question becomes: Is it low metabolism or is it low incomes? The issue of 'précarités,' the French word for disadvantaged groups, is something that comes to mind when we talk about the obesity epidemic. The one reason why energy-dense snacks are competing with fresh vegetables and fruit is because these snacks provide maximum amount of energy for the amount spent. The question is this: is there an inverse relationship between energy density and nutrient density? Is it true that energy dense snacks are in fact nutrient poor, so that reducing the energy density of the diet would have the automatic effect of increasing the nutrient content of the diet? Are the two in fact reciprocally linked?

The same question has been asked about the American diet: is it energy rich and nutrient poor? We know from data presented by the United States Department of Agriculture that the consumer is eating too many foods from the bottom and the top of the food guide pyramid – the top is the added sugars and fats and the bottom is both refined and whole grains. On the other hand, the consumption of fruit and vegetables is much less than the recommended amount. One question is the issue of cost. I have the same slide that Susan presented and I want to show it to you again for two reasons: to emphasise that what is happening is that when it comes to snacks. One key issue is: portion size – the number of calories per snack is increasing. The other issue is energy density – snacks are very often more energy dense than meals and other foods. Again, we have these twin themes here which have been raised during this meeting several times – portion size and energy density. Both are in fact extremely important in determining total energy intakes.

Significant Increase in 'Young Adults' Snacking between 1977–1978 and 1994–1996 Represents a Cause for Concern!			
Cheryl Zieser, R.D., M.S., Anne Marie Siegel Ph.D., Ph.D., and Barry M. Popkin, Ph.D. ¹ Department of Nutrition, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27599-8007 Published online February 26, 2001			
Variable	1977-78	1989-91	1994-96
Snacking occasions	1.70	1.69	1.92
Calories per snack	247	265	313
Snack ED (kcal/g)	1.05	1.30	1.32
Meal ED (kcal/g)	1.13	1.13	1.11

The third component I want to bring up here is the notion of nutrient density, and I do want to pose the question whether energy dense foods are in fact nutrient poor. I will take you through a few slides to illustrate what energy density is. We have not seen it presented in exactly this way. What I have done is to plot energy density of different types of foods against their water content, because energy dense foods are those that are dry and energy dilute foods are those that have a high water content. On this slide you see the relationship between energy density and the water content of food. Energy density is plotted on a vertical axis. The range of energy density pretty much goes between water and oil. Those are the two extremes of the range: 0 calories per gram for water and 9 calories per gram for oil. Sugar is right in the middle with 4 calories per gram.

What you see here on the horizontal axis is water content. It goes all the way from oil to soft drinks. Contrary to popular belief, soft drinks are not energy dense, they are in fact energy dilute because of their water content. On the other hand, many snacks over here are energy dense. When you put in other foods, for example dairy products, you see that milk is energy dilute, but cheese and yoghurt are more energy dense, though not nearly as energy dense as dry candy and dry cereals. Meat is in the middle of the range because of hydration, so it is not necessarily a very energy dense product. Of course most vegetables and fruit are going to be on the right, having the highest water content. On the left you see grains which have a high energy density. Vegetables and fruit will come up in the next slide.

When it comes to snacks, the popular snacks are generally energy dense, with the exception of soft drinks, which are energy dilute. So the question becomes whether or not the energy dense snacks are nutrient poor. Are vegetables and fruit, which are energy dilute, in fact nutrient rich per calorie? This is where the nutrient density index comes in. Fruits and vegetables are both energy dilute and contain a number of interesting nutrients, vitamins and minerals. Here, for example, you see vitamin C levels for various food groups. Note that many natural foods do not contain any vitamin C. On the other hand, fruits and vegetables are very rich sources and some, such as raw peppers, go right off the scale. So we have started working on new ways of measuring nutrient density per calorie.

This is not a new idea. Looking at the ratio of the nutrients in foods relative to the energy they provide has been tried before. Back in the 1970s and 1980s there were a number of studies looking at the nutrient quality index, nutrient to calories ratio, and so on. However, this research was abandoned because we were told that there were no good foods and there were no bad foods. There were only good or bad diets, and so all the foods were exactly the same. The consumer will not buy this message any more. However the consumer can be convinced that there are good foods and there are better foods. We need to have a system to assess the nutritional profile of individual foods.

There are different ways of doing that. You can have nutrients per calorie ratio, or you can have a calories per nutrient ratio. You can express this either in terms of nutrients per 100g or you can express this in terms of nutrients per serving. Or you can have nutrient to nutrient ratio, based on the good nutrients relative to the bad or problematic nutrients – the problematic nutrients being added sugar, added fat, cholesterol and salt. Here we have an interesting conceptual issue because in the United States, and I suspect elsewhere as well, healthy foods are generally defined by the absence of problematic nutrients. Foods are considered healthy if they do not contain sugar, fat, cholesterol or salt. In fact, in the United States, health claims are only permitted if the food is virtually sugar free, fat free, cholesterol free and so on. No-one pays much attention to the beneficial nutrients that the foods actually do contain. Our approach is very different from

what has gone on before because instead of saying “warning, red light! This food contains sugar”, we are saying that this food has a number of beneficial nutrients in the right proportion to the calories it contains. In such a calculation, energy density is a factor. So we are looking now at positive nutrients and for the positive nutrient content in a variety of foods.

We introduced this notion last year at a meeting in Washington, which was the Naturally Nutrient Rich Symposium Putting More Power on Americans' Plates. At the time, I made some statements about helping consumers choose naturally nutrient rich foods first and then the less nutrient dense foods as caloric needs allow. Somewhat to our surprise, because you say things in Washington and nobody listens, some of the same language turned up in dietary guidelines for Americans and more recently in the food guide pyramid. The statement in the dietary guidelines was “consume a variety of nutrient dense foods and beverages within a number of food groups, and then consume the discretionary calories as caloric needs allow”. The idea here is to prioritise the nutrient dense foods and then consume the discretionary calories with fewer nutrients in proportion to energy needs.

A preliminary NNR score for the US

- Based on 14 key nutrients
- Based on *mean* %DVs ($\sum \%DV_{1-14}/14$)
- Percent DVs based on 2,000 kcal of food
- Influenced by energy density of foods
- DVs truncated at 2000%DV for the NNR (T) score (we also used a log scale)
- No penalty for “bad” sugar or fat
- No adjustment for bioavailability
- No adjustment for rare nutrients

We have created a preliminary naturally nutrient rich score for the United States. This is a project conducted by myself and by Nicole Darmon. I will show you both the French and the American scores. The American score was based on 14 key nutrients. We based it on the mean percent daily values calculated based on 2 000 calories' worth of food. Of course, such a score is influenced by energy density because 2 000 calories of red peppers is going to be a huge amount – about 20-30kg. As a result the amount of vitamin C, vitamin A, and so on in 2 000 kcal is going to be enormous. We truncated percent daily values at 2 000 calories so that the foods which contained large amounts of one nutrient did not appear balanced because of their high scores, when in reality their score was driven by a single nutrient. To avoid controversy, we opted not to have a penalty for the good or bad nutrients, so there was no removing of points for fat or sugar content. We did not adjust for bio-availability and we did not weight the nutrients depending on their importance as perceived by us. The idea was to introduce this score as a work in progress.

The key component nutrients were selected on the basis of the nutrients listed on food labels, those that were part of the United States Department of Agriculture definition of good nutrition, and also we looked at the list of nutrients of public health interest as defined by the Food and Agriculture Organisation of the United Nations. On the left, you see the nutrients we took for the American naturally nutrient rich score, and on the right, you see the nutrients that Nicole selected for the French nutrient density score. The percent caloric values were based on slightly different

recommendations. The French and the American recommendations for the same nutrients are slightly different but this does not really make too much of a difference to the final score.

Selection of key nutrients: US and France			
US	DV	France	DV
Protein (g)	65	Protein (g)	60
NAFA (g)	30	Fiber (g)	25
Calcium (mg)	1,300	Calcium (mg)	900
Iron (mg)	18	Iron (mg)	12.5
Zinc (mg)	11	Magnesium (mg)	300
Thiamin (mg)	1.2	Thiamin (mg)	1.2
Riboflavin (mg)	1.3	Riboflavin (mg)	1.55
		Niacin (mg)	12.5
		Vitamin B6 (mg)	1.48
		Vitamin B5 (mg)	5
B ₁₂ (1g)	2.4	B ₁₂ (1g)	2.4
Refined (g)	5,000 (g)	Refined (1g)	700
Vitamin E (g)	22 (g) (15mg)	Vitamin E (g)	18 (g) (12mg)
Vitamin D (g)	400 (g) (10-1g)	Vitamin D (g)	200 (g) (5-1g)
Vitamin C	75	Vitamin C	110
Folate (1g)	400	Folate (1g)	315
Potassium (mg)	3,500		

So to answer the previous question: yes, energy dense foods tend to be nutrient poor. Although we talk about energy dense foods as being nutrient poor, until now, as Nicole pointed out, there really has not been a mathematical calculation to prove that this is, in fact, the case. What you do see here is the negative relationship with energy density. This is our naturally nutrient rich score. Note that vegetables and fruit have a very low energy density and a fairly high naturally nutrient rich score. As you go higher into energy density towards the grains and the sugars and the oils and the fats the naturally nutrient rich score drops. So yes, there is a reciprocal relationship between nutrient density and energy density. By reducing the energy density of the diet (Barbara Rolls's strategy) you increase the nutrient content of the diet (my strategy). Conversely, increasing nutrient content of foods will reduce energy density, so these are reciprocal concepts.

Now, let me show you how these concepts can be applied to consumer communication. This is the old style food guide pyramid from 2003. Note how all the foods are arranged over here. The base is grains, including whole grains, vegetables, fruit, dairy products, milk and meat and beans and nuts, and those little dots are the added fats and sugars to be consumed sparingly. The new pyramid, released just two weeks ago, is what has been called the radiant pyramid. Actually it looks as though there were an earthquake in Washington and all the food fell off the shelves. The earlier versions of the pyramid had a sequence of foods going all the way from whole grains into the doughnuts, snacks and so on. For many reasons, however, no one wanted to prioritise those foods in sequence, so notice here that the foods are arranged in no particular order. Here we have sweet potatoes, broccoli, beans, tomatoes, lettuce, carrots, corn and spinach. For the milk products we start off with cheese, then 1% milk, then yoghurt and so on. Here we have steak and chicken, and then fish. The idea was to have the nutrient dense foods up front to be consumed first, and then the less nutrient dense foods towards the top of the pyramid to be consumed more sparingly. This message has become lost and those foods are down around the base of the pyramid and seemingly in no particular order. The naturally nutrient rich score actually brings the order back into the pyramid. I can show you how it can be used to prioritise foods within the pyramid categories. I will focus here on vegetables and fruit and show you how they are arranged in sequence using the naturally nutrient rich score, from the most nutrient dense to the least nutrient dense.

Let us examine this in more detail. The naturally nutrient rich score for vegetables and fruit is on the logarithmic scale, and this

is energy density. Note that in terms of nutrients per calorie, we have spinach and romaine lettuce, broccoli, tomatoes, cantaloupe, mango, tangerines, strawberries, grapefruit, kiwi, orange juice, avocados, blueberries, and potatoes – which are a high source of potassium. Then, as we move to the left, we have the more energy dense foods such as raisins, French fries and potato chips. On the extreme left we have apple sauce, grape juice, canned peaches and canned berries in syrup, because added sugar, although not a part of the formal score, dilutes nutrient density by adding calories. So this is a way of prioritising the foods from the most nutrient dense to the least nutrient dense per calorie.

The same thing applies for meats. When it comes to nutrient density per calorie, liver is one of the super foods. On the right we have clams and oysters, beef, beef chuck, and ground beef going from the leanest to the least lean and then bacon, turkey, fried chicken, and fried meats on the left. However, there are a couple of more issues. They have to do with palatability and cost: a food may be nutrient dense but children do not like it, for example, liver, or a food can be nutrient dense but is very expensive, such as raw oysters. So you need to think in terms of balancing nutrient density with palatability, pleasure and cost – and this is exactly what we have been hearing in this symposium and over the past couple of days.

These are the scores for dairy products. Again you notice that they go all the way from skimmed milk and non-fat yoghurt with most nutrients per calorie to 1% milk, 2% milk, whole milk, cheese, ice cream and frozen yoghurt. As you move to the left, nutrient density is diluted by sugar content. These are the grains: again we have whole grains on the right, some fortified grains also on the right and then things like crackers, popcorn and so on. Here we have the fats: olive oil, which is most nutritious per calorie, versus other oils or other fats, which have less nutrients per calorie. So actually you can quite successfully assign a nutrient density score to foods within each category. To my mind, that is a more useful approach than engaging in discussions about which is more nutritious, avocado or shrimp. The useful comparisons are those within the category as opposed to across categories, but we can do that as well.

Nicole has been working on this topic in France, looking at two measures of nutrient density. One is a nutrient adequacy score, which is based on 100g of food, and the other is a nutrient density score, which is based on nutrient density per 2 000 calories. Nutrient density is the nutrient adequacy score divided by energy density. We have taken this idea one step further. In addition to talking about nutrients per calorie, we also started looking at the issue of nutrients per unit cost. When you think about it, vegetables and fruit are expensive sources of calories. They cannot compete with raw sugar in terms of sheer calories. However, the sugar is going to be just calories with no nutrients. When it comes to nutrients per unit cost, the question is whether or not vegetables and fruit come out on top. Here we are not talking so much about calories per euro but about nutrients per euro.

This is the inverse relationship between energy density and nutrient density, which you have just seen. We have an energy density graph plotted over here. This is a nutrient density score using Nicole's French data. It is very similar. Vegetables and fruit are on the right since they are very low in energy density and very high in nutrient density. The main point about food costs is that the energy dense foods cost less per calorie. The first point I want to make here is that when it comes to nutrient to energy ratio, vegetables and fruit come right at the very top. Notice here that the vegetables and fruit are low in energy density. So are sweetened beverages but their nutrient content is low as well. Candy has an energy density of 4 calories per gram and low

nutrient content. Oil has a very high energy density, but nutrient content can range from olive oil at the top to other fats and oils at the bottom. The favorable nutrients to calorie ratio is provided by the regression line. So you can start looking at the foods above and below this regression line. Over here there are more nutrients than calories, down here there are more calories than nutrients. So red meat, beef, dairy products, yoghurts are all above the line. Vegetables, fruit, dairy products, yoghurt, meat, nuts, and actually, come to think of it, the key elements of the Mediterranean diet.

The problem is that the energy dense foods actually do cost less. What you have here is energy density represented again in the same curve, and here you have energy cost in terms of euros per 100g. That is the problem: high energy dense foods are nutrient poor but energy dense foods also cost less. This means that the nutrient dense foods are going to cost more. This is the conclusion Nicole drew from her studies plotting nutrient adequacy scores against food price. Yes, it is true that the more nutrient dense foods cost more per 100g and the more nutrient dense foods cost more per 1 000 calories. But some of those foods give you adequate nutrients at a reasonable cost. Perhaps in promoting this notion to the consumer we should be focusing first of all on the positive nutrients that the foods do contain and stop obsessing about the fat, the cholesterol, the saturated fat. Then we can convey the message that fruits and vegetables are really very good value when it comes to nutrient package per unit cost. The best value foods – and again this is drawn from Nicole's work – are fruits and vegetables, then meats, especially organ meats. Well below on the nutrient to price ratio range are the fats and the oils and the sweets and the snacks. So this is a new metric that allows you to start looking at those three

concepts: energy density, nutrient density and both energy and nutrient cost. Fruits and vegetables have a very favourable nutrient to price ratio. Perhaps this is the way of conveying this information to the consumer.

There are a number of issues that need still to be resolved. We need to decide whether or not to base the score on 2 000 calories, 100g, or on food servings. This is a “naturally nutrient rich” score which means that fortified foods are not yet included. We have not devised a score for fortified foods but we may devise a new score for those later on. Right now, there is no punitive score for fat, sugar, cholesterol and salt. We have not addressed the issue of bio-availability. We recognise that spinach is not the most bio-available source of calcium or iron. The calcium in dairy products is more bio-available, haeme iron in meat is also much more bio-available. We are looking at those issues. We have not included phytochemicals and antioxidants in our calculations and we do not have a weighting scheme to favour the hard-to-get nutrients in the food supply. So this is an evolving work. I think that this is a new and interesting approach to assessing nutrient density.

To conclude, the naturally nutrient rich approach is based on the nutrient to calorie ratio. It is intended to help consumers select naturally nutrient rich foods, instead of just counting calories. What we want to do is make each calorie count more, for each calorie to contain some nutrients in the typical diet. The idea is that the nutrient dense options can then be balanced with discretionary calories as caloric needs allow. So we think that this is a nice way of looking at diet quality. We would like to link our index to other measures of diet quality and so help the consumers in their choices.

Questions

Susan JEBB

I have been working on the UK nutrient profiling system so it is very interesting in comparison. You have gone for a within category system and I just wonder whether you think it really helps us if we start prioritising one fruit or vegetable over and above another, when in actual fact what we really want to say to people is choose fruit and vegetables rather than biscuits and confectionery.

Adam DREWNOWSKI

Yes, and this is very interesting because in the past the Federal Trade Commission did not allow cross-category comparisons. Manufacturers were not allowed to say “choose this banana over snacks”. However, this is changing. We may be able to do that, but in order to be able to do that we have to have some kind of a metric to say why that is. Also I feel that the demonstration of this inverse reciprocal relationship between nutrient density and energy density is actually very interesting. We knew about it instinctively but it has not really been demonstrated until now. So we have both ways of saying “select foods from this category to begin with, but once you are within this category there are still better choices to be made.” This does not apply so much to vegetables and fruit as to grain products or to meat or dairy products; there is a huge difference between fried chicken and lean ground beef. The idea was to prioritise foods within other categories.

I would like to say a few closing remarks about this meeting in general. I think we have heard an extraordinary variety of presentations dealing with all aspects of science, from molecular biology all the way to public policy. In these two and a half days we have had a number of presentations, 61 very high quality posters, not to mention some nice lunches and dinners.

This is my conclusion. There is really no doubt any more that the Mediterranean diet and vegetables and fruit contribute to better health. The evidence suggesting this with respect to cancer, cardiovascular disease, obesity and body weight control is overwhelming. We now need to move from science towards policy and political action. The issue now is how to make those foods accessible and affordable to everybody. Then we can advertise and promote and market the various foods in such a way that they are accessible to the average consumer. So I would say that the scientific work is not entirely over but it is convincing. Where we need to go now is towards more policy and political action, marketing, and changes in some of our agricultural policies.

Conference Conclusion

Luciano TRENTINI
AREFLH President

I would like to thank you for the chance you gave me to conclude the works for this very important congress in which fruit and vegetable products have an important role in promoting consumers' health.

First of all I would like to explain what this meeting of European Regions (AREFLH) is.

AREFLH was established in Aquitania in 1999, with many French Regions, on the will of Guy San Martin, Regional assistant chief. Its aim is to improve the fruits and vegetables system. Other Regions from Spain, Portugal, Italy entered in AREFLH that is constituted today by 23 Regions which represent more than 30% of the European fruits and vegetables system as production value.

In these years AREFLH achieved important results, first of all a better application of 2200/96 Regulation that concerns the common organisation for the market of fresh fruits and vegetables.

AREFLH worked to promote the establishment of a group of more than 30 members of the European Parliament who are interested in this important field. AREFLH has an active part in meetings of this group. Its tasks include secretary's office and technical support. Public Institutions and a Producers Committee (directed by "Catalonia Qualità" - an association of producer's organisations of the Spanish Region) associated in AREFLH.

In this Association there are many branches that deal with different activities: the reform of the common organisation of the market (O.C.M), technical matters such as research and experimentation, in particular integrated production system that is productive methods which reduce negative effects on environment and health. These methods consider reliability of productions as an instrument to warrant the quality of fruits and vegetables.

A special thanks for the organisation that arranged this congress giving the scientific community the opportunity to know the fruits and vegetables productive system organised by AREFLH.

In these days we have understood the importance of fruits and vegetables consumption for consumers' health. Eating little quantity of fruit and vegetables increases the risk of many chronic diseases. We know that in many developed countries political programs concerning nutritional matters wants to increase the use of fruit and vegetables to reach at the least the result of 500g per head a day.

Both every day press and specialized periodicals on agriculture talk about problems regarding the fruits and vegetables system such as overproduction, destruction or distillation of fruit, overprice, orchards removal.

On the square I didn't expect to talk about prices in this occasion too. I think it is important to mention a matter of fact. In Italy every citizen spends 16-18% of his income to buy food. Only 2-3% of this expense is used to buy fruits and vegetables. It is a quite low value.

I would like to make another example: the rate of consumption of processed tomato products is about 22 kg per head. In this case the value of the raw material is just about 10%. If you consider the cost of fresh tomato, this value per year is equal to the cost of 2 or 3 cups of coffee.

So we can say that the price of fruits and vegetables is high but if we compare it to the cost of others goods like coffee or mineral water, we can realize that their value is not too high if we consider benefits that come from consumption of these products.

Despite that, the most worrying fact is the steady drop off of consumption. This reduction is about 10% in the last five years. In a worldwide market we can observe a decrease of consumption, a real reduction of the number of farms and of the amount of their income.

So in the future we have to consider that availability of fruits and vegetables coming from European Countries may reduce more and more, all to the good of products coming from non European Countries, maybe less safe and reliable than ours for quality but less expensive.

We know that many Countries are making projects such as "five times a day or ten times a day" or "the five colors of health". I think that all these ideas should be promoted in a better way maybe with the common effort of different European Countries. This common effort should take into account the value of food as a nutrient, the benefits for human health, his "nutraceutical" value that is a value which concerns nourishment and pharmaceutical aspects.

In these days we talk a lot about industry supporting health system. Today we would like to say that primary raw products too can and have to benefit by their distinctive features or particular productive techniques; these particular features make these products different from common agricultural products.

We could plan together what, how and when cultivate bearing in mind that the different kinds of fruit and vegetables contain elements which protect health. Many farming in Europe cultivate products rich in anthocyanin, carotenoids, lycopene, (cabbages, carrots, pumpkins, apricots, kiwi and pears). As a consequence, it is necessary to join forces to improve contact with consumers.

By increasing the consumption of fruit and vegetables we could protect health in the best way that is choosing natural foods without spending too much.

AREFLH has an important role in communication. In fact we are planning a project in order to make students aware of the value of our productions (Interreg III C with the partnership of Italy, France and Spain). This project concerns educational farms that are farms which can have a main role in alimentary education.

I hope that the AREFLH activities, for the next EGEA congresses, can support more and more your scientific research.

TITLE	page
Dietary and life-style determinants of mammographic breast density: a prospective study in a Mediterranean population	148
Consumption of vegetables and fruit in a sample of European children from 9 countries: The Pro Children cross-sectional survey	148
Comparison of oxidative stress status and carotenoid status in volunteers from five European countries	149
Meal patterns and obesity	149
Association of diet quality with lifestyle variables, energy density, and macronutrient intake at population level	150
Relationship between folate status and the healthy eating index in a group of schoolchildren	150
Only a minority of Spanish adolescents consumes an adequately-composed breakfast - Regional results from the AVENA* Study	151
Food habits in Spanish institutionalized elderly group. Adherence to the Mediterranean Diet	152
Adequacy of food intake compared with the Mediterranean diet in a group of young women depending on smoking habits	152
Differences between of the habitual consumption with regard to what consider an adequate diet in a collective of physically active young	153
Consumption of aliments in a group of diabetic and non-diabetic elderly Spanish people	153
Mediterranean diet scoring: theory and application to the portfolio eating plan	154
High-fat, high fruit and vegetable diets: associations with dietary energy density and weight status	154
A nutrient density standard for vegetables and fruit: Nutrients per calorie and nutrients per unit cost	155
Trends and intake structure of calcium from dairy products in the population of youth aged 13-18	155
Nutritional profil and hematological parameters in Tunisian children	156
Evaluation of the phenolic content of olive oil at various stages of the milling process	156
Dietary diversity and school age child nutrition in North Western Morocco	157
Evaluation of Vitamin D Insufficiency and Its Influencing Factors in Reproductive Age Women in Tabriz	157
Weight gain over ten years in over 6,000 adults from a Mediterranean population. The EPIC Florence study	158
Intake of different food groups according to the presence of overweight/obesity in a group of schoolchildren from Madrid (Spain)	158
Evidence for gene-nutrient interaction at the PPAR γ locus in the regulation of BMI and triglycerides	159
Health Hunters: An intervention to prevent overweight and obesity in young high risk women	159
Energy and macronutrients intake differences between overweight and obesity young women	160
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	160
Antioxidant status and diabetes risk in the SU.VI.MAX study - Association with baseline plasma levels and effect of antioxidant supplementation	161
Varied vegetable intake is associated with improved lipids: a six-month dietary intervention with a Mediterranean-style diet in Type 2 diabetes.	161
Histopathological studies of the hepatic tissue of the sand rat (PSAMMOMYS obesus) during diabetes development	162
Impact of a Mediterranean type of diet on the metabolic syndrome	162
Effects of polysaturated and monosaturated fat diet on insulin action and sensitivity in cultured rat hepatocytes	163
Relationship between ADRB2 and UCP3 variants and risk of type 2 diabetes mellitus in a southern Italy population	163
Comparison between saturated and monounsaturated fatty acid-enriched diets on oxidative status of patients with type 2 diabetes	164
Involvement of abdominal obesity, sugar intake and physical inactivity in the occurrence of metabolic syndrome and diabetes in Moroccan women	164
Dietary patterns and coronary heart disease mortality	165
Decline of cardiovascular disease mortality in Poland between 1991-2002 – Contribution of changes in dietary habits	165
Dietary habits and cardiovascular risk factors of the Warsaw population in years 1993-2001 – Pol-MONICA Project	166
Effect of Mediterranean vegetable soup ingestion on plasma vitamin C and antioxidant biomarkers in humans	166
Vitamins C and E suppress stimulated peripheral blood mononuclear cells in vitro	167
Evaluation of nutritional and metabolic risk factors coexistence taking into consideration cardiovascular diseases	167
Mediterranean diet has a beneficial effect on blood lipids in a normal Swedish population the INTERGENE research program	168
Dietary fiber intake and risk factors for cardiovascular disease in French adults from the SUVIMAX cohort	168
Geographical influences on the association between adherence to the Mediterranean Diet and the Prevalence of Acute Coronary Syndromes, in Greece; the CARDIO2000 Study	169
Sociodemographic and dietary characteristics of persons with different self-rated health	169
Effect of folic acid supplementation on plasma homocysteine levels in patients with coronary artery disease	170
The effects of medical nutrition therapy (MNT) on the blood lipid levels and nutrients intake in Korean hyperlipidemic patients	170
Metabolic syndrome and breast cancer recurrences	171
Evidence of protective effect of dietary antioxidant on breast cancer risk in the prospective cohort of ORDET	171
Differences in food intake and cardiovascular disease risk factors between persons with normal and elevated homocysteine level	172
Reduction of oxidative DNA damage in post-menopausal women by consumption of a high-phenol extra virgin olive oil: a randomized cross-over trial	172
Dietary trans-fatty acids and risk of breast cancer: findings from ORDET Prospective Study	173
Raw broccoli increases DNA damage in colonocytes	173
5-methoxypsoralen, a compound found in produce, causes hepatotoxicity	174
Modulation of Telomerase Gene Expression by Zinc in Bladder Cancer Patients	174
Study of serum levels of Zn, Cu and Cu/Zn ratio in breast cancer patients	174
The 'Israeli gender paradox': Higher women risk vs 'Cancer shift' to the leading cause of death	175
"5-a-day" in Germany – a small step toward Mediterranean diet and realisation problems in everyday life	175
"Chance for the Young Heart" - Polish educational programme of prophylaxis of cardiovascular disorders for children and young people	176
Free participation in the Norwegian School Fruit programme: Increased fruit and vegetable intake gives decreased consumption of unhealthy snacks	176
The effectiveness of 5-a-day advertisement at the point of sale in Germany	177
Comparative analysis of National School Fruit & Vegetable Schemes in Denmark, Norway, England, the Netherlands and the United States	177
Low cost diets: energy-dense, nutrient-poor	178
Generic campaign in The Netherlands: 'Feel great with fruit and vegetables' 2003-2006	178

The first five posters have been selected by EGEA Scientific Committee for an oral presentation on Saturday, May 21st, 2005

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) has 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.

Supported by grants from Associazione Italiana per la Ricerca sul Cancro (AIRC, Milan, Italy) and the World Cancer Research Fund (2001/34).

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.

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 lycopene and β -cryptoxanthin was tomatoes and oranges respectively in all participating countries. Serum concentration of β -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 was 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 play 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 our results, a protective effects of the Mediterranean-like diet from carotenoids status could be explained by a protective effects of carotenoids on SH groups, but not on LDL oxidizability. 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.

This work was supported by the European Union (AIR2-CT93-0888).

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.

Association of diet quality with lifestyle variables, energy density, and macronutrient intake at population level

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Objective: 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.

Methodology: 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 schoolchildren.

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 value if the diet is adequate 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 ($r=0.18$, $p<0.05$).

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.

	Poor Diet (score <50)	Needs improvement (score 50-80)	Good diet (score >80)
Children	11	109	8
Folate intake ($\mu\text{g/d}$)	$201.6 \pm 43.0 \text{ b}^*$	245.2 ± 66.2	$284.8 \pm 64.2 \text{ b}^*$
Coverage of RDI (%)	$80.7 \pm 17.2 \text{ b}^*$	97.9 ± 26.5	$113.9 \pm 25.7 \text{ b}^*$
Folate density ($\mu\text{g}/1000 \text{ kcal}$)	$87.7 \pm 9.6, 2 \text{ a}^{**} \text{ b}^*$	$116.7 \pm 30.1 \text{ a}^{**}$	$126.9 \pm 21.8 \text{ b}^*$
Serum folic levels (ng/mL)	$8.4 \pm 3.7 \text{ b}^*$	$10.1 \pm 5.6 \text{ c}^*$	$12.1 \pm 7.2 \text{ b}^* \text{ c}^*$

Equal letters mean significant difference between the groups. $^{**}p<0.01$, $^*p<0.05$.

Study funded by Danone Vitapole

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

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Introduction: An adequately composed breakfast can essentially contribute to cover daily nutrient needs, especially during childhood and adolescence¹.

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 study² (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.

References:

1 Nicklas TA, Bao W, Webber LS, Berenson GS. Breakfast consumption affects adequacy of total daily intake in children. J Am Diet Assoc. 1993;93:886-91.

2 González-Gross M, Castillo MJ, Moreno L, Nova E, González-Lamun_o D, Pérez-Llamas F, Gutiérrez A, Garaulet M, Joyanes M, Leiva A, Marcos A. Feeding and assessment of nutritional status of Spanish adolescents (AVENA study). Risk evaluation and intervention proposals. I. Methodological description of the study. Nutr Hosp. 2003;18:15-28.

* Project sponsored by the Spanish Ministry of Health, Instituto de Salud Carlos III (FIS 00/0015). Scholarships sponsored by Procter&Gamble S.A., Panrico, S.A., Consejo Superior de Deportes, Ministerio de Educación y Cultura (AP 2003-2128).

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 deficiencies 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.

Conclusion: Our results provide evidence supporting the progressive withdrawal from traditional MD even in elders. Introduction of corrective policies or a initiate campaigns 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.

Table 1. Daily servings intakes of the different groups of food. Comparison with the daily recommended servings (DRS) for MD (X \pm SD). Differences depending on the sex.						
	DRS FOR MD	DAILY SERVING INTAKE TOTAL SAMPLE		DAILY SERVING INTAKE MEN WOMEN		COV
Cereals and pulses	6 - 10	3.27 \pm 0.94	***	3.78 \pm 0.76	2.99 \pm 0.92	***
Fruits	2 - 4	1.20 \pm 0.70	***	1.01 \pm 0.41	1.30 \pm 0.80	**
Vegetables	3 - 5	1.75 \pm 0.54	***	1.88 \pm 0.60	1.68 \pm 0.51	-
Dairy Products	2 - 3	2.10 \pm 0.64	*	2.04 \pm 0.64	2.13 \pm 0.65	*
Meat, fish and eggs	2 - 3	1.43 \pm 2.2	***	1.59 \pm 0.40	1.34 \pm 0.38	*

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

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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 \pm 76.0 g/day) than in smokers (145.6 \pm 69.1 g/day) and passive smokers (141.2 \pm 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 \pm 122.0 g/day in actives and 231.1 \pm 108.4 g/day in passives) than non-smokers (272.1 \pm 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 \pm 12.0 g/day) than non-smokers (27.9 \pm 13.7 g/day) and passive smokers (28.1 \pm 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.

Sources of support : This work was financed by el Instituto de la Mujer (Nº de Expediente: PR217/98-Nº8111)

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), especially in relation with the cereals and with the vegetables (1).

Conclusion: The lack of knowledge on the characteristics of a diet adapted for physically active people is emphasised, as well as 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.

I.-ORTEGA R.M., REQUEJO A.M., ODRIOZOLA J.M. Nutrition and exercise. Guide to plan the feeding of physically active people. Universidad Complutense de Madrid. 1999

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

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

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 ($X \pm DS$).					
	NON-DIABETIC		DIABETIC		ANOVA2 DIABETES
	MEN	WOMEN	MEN	WOMEN	
Cereals	3.26 ± 0.77	2.89 ± 0.86	3.67 ± 0.86	2.58 ± 0.90	*
Bread	1.56 ± 0.64	*	1.90 ± 0.89	***	*
Simple sugars	1.31 ± 0.47	1.39 ± 0.54	0.83 ± 0.55	1.58 ± 0.70	***
		1.29 ± 0.52		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.

I. REQUEJO AM, ORTEGA RM (1995). Tríptico: "La nutrición correcta en las personas mayores". Ayuntamiento de Madrid, Dpto. de Nutrición (UCM) (Spain). Sources of support: This work was financed by Unilever Netherland.

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 cut-off 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.

References :

1. Jenkins, DJA et al. Am. J. Clin. Nutr. 2005 ;81:380-387.

2. Jenkins, DJA et al. JAMA. 2003;290:502-510.

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 ($\leq 30\%$ 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%, $p<0.0019$) and within the high-fat, low F&V pattern (18%, $p<0.0003$); 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.

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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.

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) inhabiting 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 chi2 test with p£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.

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 \pm 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 (m²)). 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 μ g/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 affects iron serum levels and haematological parameters in Tunisian children.

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 antioxidant 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, (+)-pinorelinol, (-)-epi-pinorelinol, (+)-1-acetoxypinorelinol, 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 (sweets) 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

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.

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.

References

- 1 Cole T, Bellizzi M, Flegal K, Dietz W. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BJM*. 2000;320: 1-6.
- 2 Ortega R, Requejo A, Andrés P, López A, Redondo M, González M. Relationship between diet composition and body mass index in a group of Spanish adolescents. *Br J Nutr*. 1995;74: 765-773.

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Evidence for gene-nutrient interaction at the PPAR γ locus in the regulation of BMI and triglycerides

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

Methods: 201 unrelated patients with type 2 diabetes (118 men and 83 women), 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 carriers. Participants were stratified according to sex-specific tertiles of caloric intake and PPAR γ 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 PPAR γ ; $p=0.022$ 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 (tertile 1 vs tertiles 2+3) and PPAR γ 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 PPAR γ ; $p=0.149$ for the effect of P/S ratio, $p=0.023$ for interaction).

Conclusion: This study provides evidence of a diet-gene interaction at the PPAR γ 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.

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/m²,) or obesity (OB, BMI ≥27 kg/m²) in a group of young women is the aim of this study.

Methodology: 67 women (20-35 years) with BMI between 24-35 kg/m². 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 nutritional 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.

1-ORTEGA RM, LÓPEZ-SOBALER AM, REQUEJO AM, ANDRÉS P. (2004). La composición de los alimentos. Herramienta básica para la valoración nutricional. Ed. Complutense. Madrid.

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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 and 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.

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 2nd and 3rd tertiles of serum baseline levels of b-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 b-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 HbA1c were measured and patients completed a dietary questionnaire.

Results: Patients lost weight on the HCLF diet, otherwise between diet effects did not differ (Table).

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.

	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
HbA1c (%)	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;

c P=0.06 within MS diet (Student's paired t-test);

d P<0.05 between diet effect (Student's unpaired t-test)

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 (Po) 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 Po 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 lysosomal 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 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.

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 γ -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 β -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 ADRB1 Gly389Arg, Arg16Gly ADRB2, Gln27Glu ADRB2, G(-866)A UCP2, C(-55)T UCP3, Pro16Ala PPAR α and Gly483Ser PGC1. We genotyped all subjects by SYBR green Realtime PCR. Age, sex and 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.

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 CuSO₄ 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 α -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 α -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.

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.

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.

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.

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 B2, calcium, magnesium, potassium and iron were significantly ($p<0,01$) higher in both genders, vitamin B1 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.

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-epiPGF2a (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-epiPGF2a, 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-epiPGF2a concentration was significantly lower ($P = 0.05$) at the end of the study. Plasma levels of vitamin C and 8-epiPGF2a 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-epiPGF2a 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- α , 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 α -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.

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

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The increasing global occurrence 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 of 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-Mazuria 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/m^2), 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, and 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 coefficient $p \geq 0.5$ 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 program¹ 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

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.

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 triglycerides 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.

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

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Objective: Elevated plasma homocysteine concentrations are 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 folate 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 $\mu\text{mol/L}$ vs. 39/75 $\mu\text{mol/L}$) ($P < 0.001$). Decreased rate of plasma total homocysteine concentration was higher in patients with initial plasma total homocysteine > 30 $\mu\text{mol/L}$ than other groups (15/56 $\mu\text{mol/L}$ vs. 23/21 $\mu\text{mol/L}$) ($P < 0.002$).

Supplementation with folic acid normalized plasma total homocysteine levels ($< 15 \mu\text{mol/L}$) 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.

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.

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 database on total antioxidant capacity of Italian foods and beverages (Pellegrini N., 2003), integrated with 50 values for cereal and cereal 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 semi-quantitative 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 levels 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.

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 \geq 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 modified 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.

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 mg/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.

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 semi-quantitative 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% confidints 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.

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

	HR (95% CI) for increasing quintiles					P for trend
	I	II	III	IV	V	
Model 1*	1	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**	1	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***	1	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.

¹ USDA Nutrient Database for Standard Reference, 1999.

² Food Standards Agency, 2002 McCance & Widdowson's. The composition of foods, 6th edition.

³ Livelli di ingestione di lipidi e acidi grassi in Italia: I risultati dell'azione concertata CE "Transfair". Pizzoferrato L et al., 1999 La Rivista di Scienza dell'alimentazione: 28(3):259-270.

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.

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References:

van Poppel G et al. (1999) *In Advances in Nutrition and Cancer* 2, pp. 159-168 [A Zappia, FD Ragione, A Barbarisi, GL Russo and RD Iacova, editors]. New York, USA: Kluwer Academic/Plenum Publishers.

Ratcliffe B et al. (1999) *In Natural Antioxidants & Anticarcinogens in Nutrition, Health and Disease*, pp. 440-442 [JT Kumpulainen and JT Salonen, editors]. Cambridge, UK: Royal Society of Chemistry.

Ratcliffe B et al. (2000) *In Dietary Anticarcinogens and Antimutagens- Chemical and Biological Aspects*, pp. 161-164 [IT Johnson and GR Fenwick, editors]. Cambridge, UK: Royal Society of Chemistry.

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 mammals 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 μ m intervals and stained with hematoxylin and eosin for morphological examination. Exposure to the high doses of 5-MOP caused hypertrophy of centrilobular 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.

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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 _ tumors, 83.3% (5 of 6) of the Grade __ tumors and 50% (9 of 18) of the Grade ___ 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 _, Grade __ and ___ 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.

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 suggest 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, 15th vs 37th in 44 European countries, compared to the rank for Ischemic Heart Disease (IHD), 34th vs 38th, and Cardio Vascular Disease (CVD) 42th vs 44th, 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 suggest 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.

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"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 knowledge of healthy diets.

“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 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

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. Details are provided in Table 1. 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.

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 has 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 dietitians, 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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