CHAPTER 3

A DIETARY MODEL CONSTRUCTED BY SCIENTISTS

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The purpose of this article is to review the historical development of the healthy food model of the Mediterranean Diet and related scientific knowledge from the early 1960s to the present time. The review presents the origins of the first pyramid of the traditional Mediterranean Diet in 1993 and how it has been revised to produce, in 2010, a new updated Mediterranean Diet pyramid. What emerges over the years is the evolution of the Mediterranean Diet from a range of specific foods to a comprehensive Mediterranean lifestyle in which food, health, culture, people, and sustainability all interact, even if its practice in the Mediterranean is diminishing. The food transition in Mediterranean countries and the emerging issues of overweight and obesity are also highlighted in the article.

The present-day lifestyle is characterised by a wide availability of food and an ever-increasing rate of physical inactivity leading to a situation of apparent psycho-physical well-being, which, however, often does not correspond with the real state of health. The typical eating habits of the Mediterranean populations have been progressively enriched

with high-protein foods, saturated fats and sugars to the point where intake now exceeds the necessary intake levels. We are thus living in an age of "apparent well-being", where the increase in life expectancy runs parallel to the increase in the risk of diseases such as obesity, metabolic syndrome, cardiovascular disease and cancer. The new pyramid of the Modern Mediterranean Diet, addressed to individuals from 18 to 65 years of age, takes the evolution of society into consideration, highlights the fundamental importance of engaging in physical activity and conviviality and of drinking water, and lays emphasis on the consumption of local seasonal food products.

It is a Mediterranean Diet that has been revised in the light of modernity and well-being but also allows for the various cultural and religious traditions and different national identities. The new pyramid is a simple mainframe, which can be adapted to the current needs of the Mediterranean people with respect to all local variants of the Mediterranean Diet. Following the recent inscription of the Mediterranean Diet in UNESCO's List of the Intangible Cultural Heritage of Humankind, the new revised Mediterranean pyramid aims to popularise the concept and in particular to emphasise its applicability to present-day lifestyles in order to counteract the current dramatic decline in the healthy Mediterranean dietary pattern throughout the Mediterranean area.

From concept to development

A large-scale study conducted in the 1960's (Cresta *et al.*, 1969) revealed that diets in the Mediterranean areas were characterised by a much higher intake of cereals, vegetables, fruit, and fish and a much lower intake of potatoes, meat and dairy foods, eggs, and sweets. The traditional Mediterranean Diet of the mid 1960s was also characterised by high consumption of plant foods and high intake of olive oil as the principal source of mono-unsaturated fat.

In 1970, Ancel Keys published "*Coronary heart disease in seven countries*" (Keys, 1970) and in 1975 "*How to eat well and stay well. The Mediterranean way*" (Keys, 1975). Later, in 1980, he published "*Seven countries: a multivariate analysis of death and coronary heart disease*" (Keys, 1980). The seven countries participating in that study were the United States, Japan, Italy, Greece, the Netherlands, Finland and Yugoslavia. These studies established the scientific interest in the health benefits of the Mediterranean Diet. Keys summarised his major contribution to the Mediterranean Diet thus: "My concern about diet as a public health problem began in the early 1950s in Naples, where we observed very low incidences of coronary heart disease associated with what we later came to call the 'good Mediterranean Diet'. The core of this diet was mainly vegetarian, and differed from American and northern European diets in that it was much lower in meat and dairy products and used fruit for dessert. These observations led to the subsequent research in the *Seven Countries Study*, in which it was demonstrated that saturated fat was the major dietary villain." (Keys, 1995).

In 1988, a symposium on "The Mediterranean Diet and food culture" was held in Delphi, Greece, sponsored by the Association of Schools of Public Health in the European Region and the European Regional Office of the WHO. Selected papers from this symposium were then published in a special issue of the European Journal of Clinical Nutrition –

edited by Antonia Trichopoulou and Elisabet Helsing – which was devoted to the Mediterranean-type diet (Trichopoulou and Helsing, 1989). These studies concerned Mediterranean food patterns, which seemed to meet all the criteria of a prudent or healthy diet.

The European MONICA research project, conducted in the 1980s (Stewart *et al.*, 1994), confirmed the South-North gradient in the incidence of cardiovascular disease in Europe and further established the relationship between dietary habits and cardiovascular health, with much reduced mortality rates for persons following a Mediterranean-type dietary pattern.

In 1992, a seminar was held in Barcelona, Spain, on the "*Changing patterns of fat intake in Mediterranean countries*", sponsored by the Catalonian Department of Health in collaboration with the European Office of the World Health Organisation, and selected papers were subsequently published in a second special issue of the European Journal of Clinical Nutrition devoted to the Mediterranean-type diet, edited by Lluís Serra-Majem and Elisabet Helsing (Serra-Majem and Helsing, 1993).

The increasing awareness of scientists concerning the nutrition and lifestyle of certain Mediterranean populations led to the International Conference on "*The Diets of the Mediterranean*", which was held at the Harvard School of Public Health (Cambridge, MA) in 1993, and organised by Oldways Preservation & Exchange Trust and the WHO/FAO Collaborating Center for Nutritional Epidemiology. Selected papers were again published in a special issue of the American Journal of Clinical Nutrition edited by Marion Nestle (Nestle, 1995), who highlighted the fact that there was research evidence linking this particular Mediterranean dietary pattern to the improved health and longevity of the populations consuming it. In particular, she emphasised that, given worldwide trends towards dietary uniformity, classic Mediterranean Diets were endangered and a great deal of basic and applied research was needed to define how such traditional and healthful dietary patterns could be preserved and promoted (Nestle, 1995).

The First International Congress on the Mediterranean Diet was convened by the for Mediterranean Diet Foundation in Barcelona in 1996 and led to the signing of the "*Declaration of Barcelona on the Mediterranean Diet*", which emphasised both its healthy eating aspects and its cultural and historical dimensions. Since then, the Congress on the Mediterranean Diet has taken place every two years with the subsequent publication of selected papers of the proceedings in special editions of Public Health Nutrition (Serra-Majem, Bach-Faig, Roman, 2004; Serra-Majem, Bach-Faig, 2008; Serra-Majem, Bach-Faig, Miranda, Clapés, 2010).

The International Task Force for Prevention of Coronary Heart Disease convened an International Conference on the Mediterranean Diet in London in the year 2000, at which a "Consensus statement: dietary fat, the Mediterranean Diet, and life-long good health" was issued: "There is increasing scientific evidence that there are positive health effects from diets which are high in fruits, vegetables, legumes, and whole grains, and which include fish, nuts and low-fat dairy products. Such diets need not be restricted in total fat as long as there is not an excess of calories, and should emphasise predominantly vegetable oils that are low in saturated fats and partially hydrogenated oils. The

traditional Mediterranean Diet, whose principal source of fat is olive oil, encompasses these dietary characteristics" (International Task Force for Prevention of Coronary Heart Disease, 2000).

A meeting of the International Task Force on the Mediterranean Diet was held in Barcelona in 2002; it was organised by the Foundation for the Advancement of the Mediterranean Diet, and it was at that meeting that the re-definition of the Mediterranean Diet was discussed for the first time as well as the need to update and define it with a degree of openness that would acknowledge any healthy changes within this model that have occurred over the last 40 years or that may come about in the future (Serra-Majem *et al.*, 2004). The First Forum on Mediterranean Food Cultures was held in Lamezia Terme, Italy, the same year; it was organised by the Universitas Italica Foundation, in which nutritionists and food anthropologists agreed to collaborate on the Mediterranean Diet and Mediterranean food cultures as a common ground for a unique cultural heritage, which needed to be preserved and acknowledged amongst Mediterranean people (Dernini, 2006).

As the continuation of this interdisciplinary and multicultural dialogue between nutritionists and anthropologists, the Third Forum on Mediterranean Food Cultures took place in Rome in 2005 at Sapienza University; it was organised by the Food Sciences Institute of the university, where the process was initiated for UNESCO recognition of the Mediterranean Diet as an intangible cultural heritage. "*The 2005 Rome Call for a Common Action on Food in the Mediterranean*" was issued at that meeting (Dernini, 2006); this document pointed out that the ancient Greek word δίαιτα means 'equilibrium', 'lifestyle', and presented the Mediterranean Diet as more than just a diet – as an entire lifestyle pattern in which physical activity played an important role. It was proposed that a common definition of the Mediterranean Diet be established as a priority so that all Mediterranean countries could present a common perspective and an overall interdisciplinary strategy for safeguarding and enhancing it.

In 2007, the governments of Greece, Italy, Morocco and Spain, with the technical coordination of the Foundation for the Advancement of the Mediterranean Diet, submitted a transnational application to UNESCO for recognition of the Mediterranean Diet as part of the intangible cultural heritage of humankind, and the Barcelona Declaration on the Mediterranean Diet as an Intangible Cultural Heritage was issued in Barcelona the same year (Reguant-Aleix *et al.*, 2009). It was unanimously agreed that full support would be given to this application for inclusion of the Mediterranean Diet on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity.

In 2009, the Mediterranean Diet Foundation (MDF) and the Forum on Mediterranean Food Cultures launched a process of dialogue for reaching a consensus in the international Mediterranean scientific community on a new revised, updated and unpatented Mediterranean pyramid as well as on the Mediterranean Diet as a model of a sustainable diet (Gussow and Clancy, 1986; FAO, 2010). That consensus was reached in November 2009 at the Third International CIISCAM Conference held in Parma, Italy, and was further developed at the Eighth International Congress on the Mediterranean Diet held in Barcelona by the MDF in March 2010.

Various definitions by nutritionists

It is indeed of interest to compare the various definitions of the Mediterranean Diet given by leading nutritionists.

Ancel Keys: "What is the Mediterranean Diet? One definition might be that it is what the Mediterranean natives eat. But as we know and think of it now, it is a relatively new invention. Tomatoes, potatoes, and beans, for example, came from America long after Christopher Columbus discovered the New World. I noticed that the heart of what was considered the Mediterranean Diet is mainly vegetarian: pasta in many forms, leaves sprinkled with olive oil, all kinds of vegetables in season, and often cheese, all finished off with fruit, and frequently washed with wine" (Keys, 1995).

Marion Nestle: "A largely plant-based dietary pattern of societies in countries surrounding or surrounded by the Mediterranean Sea. For purposes of discussion in this supplement, however, the term refers specifically to the diets in the early 1960s in Greece, southern Italy, and other Mediterranean regions in which olive oil was the principal source of dietary fat" (Nestle, 1995).

Walter Willett *et al.*: "The term 'Mediterranean Diet' has a specific meaning. It reflects food patterns typical of Crete, much of the rest of Greece, and southern Italy in the early 1960s. The selection of this specific time and these geographical areas is based on three lines of evidence: 1) Adult life expectancy for populations in these areas was among the highest in the world, and rates of coronary heart disease, certain cancers, and some other diet-related chronic diseases were among the lowest in the world in the early 1960s, despite limitations of existing medical services. 2) Data on food availability and dietary intake in the Mediterranean region describe patterns with many common characteristics. 3) Dietary patterns sharing many of these common characteristics have been associated with low rates of chronic diseases and high adult life expectancy in numerous epidemiological studies conducted through the world... As defined here, it is closely connected with traditional areas of olive cultivation in the Mediterranean region. Thus, the generic term 'Mediterranean Diet' refers to dietary patterns found in olive-growing areas of the Mediterranean region more than 30 years ago" (Willett *et al.*, 1995).

Anna Ferro-Luzzi and Francesco Branca: "Since Keys' first observations in the 1960s, the Mediterranean Diet has been under scrutiny by researchers and public health specialists for its health-promoting qualities. Detailed analysis of food surveys carried out in Italy at that time permitted the definition of an Italian-style Mediterranean Diet, characterised by low total fat (< 30% of energy), low saturated fat (<10% of energy), high complex carbohydrate, and high dietary fiber" (Ferro-Luzzi and Branca, 1995).

Antonia Trichopoulou and Pagona Lagiou: "The term 'Mediterranean' diet refers to dietary patterns found in olive-growing areas of the Mediterranean region and described in the 1960s and beyond. There are several variants of the Mediterranean Diet, but some common components can be identified: high monounsaturated/saturated fat ratio; ethanol consumption at moderate levels and mainly in the form of wine; high consumption of vegetables, fruits, legumes, and grains; moderate consumption of milk and dairy products, mostly in the form of cheese; and low consumption of meat and meat products" (Trichopoulou and Lagiou, 1997).

Lluís Serra-Majem *et al.*: "The term 'Mediterranean Diet' reflects the dietary patterns characteristic of several countries in the Mediterranean Basin during the early 1960s. The association between longevity and reduced mortality and morbidity for coronary heart disease, certain cancers and other nutrition-related diseases, and the common dietary food patterns in these countries, have substantiated this concept" (Serra-Majem *et al.*, 2004).

On 16 November 2010, UNESCO approved the inscription of the Mediterranean Diet in the List summarising it as follows: "The Mediterranean Diet constitutes a set of skills, knowledge, practices and traditions ranging from the landscape to the table, including the crops, harvesting, fishing, conservation, processing, preparation and, particularly, consumption of food. The Mediterranean Diet is characterized by a nutritional model that has remained constant over time and space, consisting mainly of olive oil, cereals, fresh or dried fruit and vegetables, a moderate amount of fish, dairy and meat, and many condiments and spices, all accompanied by wine or infusions, always respecting the beliefs of each community" (UNESCO, 2010).

Mediterranean Diet and health

The health benefits of the Mediterranean Diet and its prophylactic effect against chronic diseases has been well established by the scientific community.

Cardiovascular diseases

The pioneer Seven Countries Study conducted by A. Keys was the first to establish the association of a traditional Mediterranean dietary pattern with a markedly reduced incidence of coronary heart disease mortality (Keys, 1970; Keys, 1980). On the basis of this initial knowledge, scientists constructed dietary scores of adherence to the traditional Mediterranean Diet by indexing positively those beneficial foods which are mostly consumed and negatively the foods less consumed and more typical of the western industrialised world (Trichopoulou *et al.*, 1995; Menotti *et al.*, 1999; Sánchez-Villegas, 2003; Fidanza *et al.*, 2004; Bach *et al.*, 2006; Gerber, 2006; Issa *et al.*, 2011). This comprehensive dietary tool enabled new large-scale comparative surveys among different population samples. Indeed, numerous more recent epidemiological surveys were conducted in various countries and confirmed that good adherence to the traditional Mediterranean Diet is systematically associated with a markedly reduced risk of cardiovascular events and mortality (Trichopoulou *et al.*, 1995, 2003 and 2005; Martínez-González *et al.*, 2002; Estruch *et al.*, 2006; Buckland *et al.*, 2009).

In addition, an intervention study with a Mediterranean-type diet has been conducted in France on subjects with cardiovascular disease and showed a 70% reduction in the cardiovascular event rate after 4.5 years' follow-up (Lorgeril *et al.*, 1994). Other intervention studies performed in Italy, France and Spain on subjects at risk of cardiovascular disease all showed improvement for several risk factors (lipoproteins and cholesterol, hypertension, insulin sensitivity, inflammation) after a Mediterranean-type diet (Esposito *et al.*, 2003; Vincent-Baudry *et al.*, 2005; Panagiotakos *et al.*, 2007; Lairon, 2007; Salas-Salvado *et al.*, 2008). The reasons for these marked beneficial effects of a Mediterranean Diet on cardiovascular risk and mortality have been studied further. Indeed, surveys

have repeatedly shown that adherence to a Mediterranean dietary pattern is associated with reduced body weight (Mendez *et al.*, 2006; Panagiotakos *et al.*, 2006; Sánchez-Villegas *et al.*, 2006; Buckland *et al.*, 2008; Issa *et al.*, 2011; Zazpe *et al.*, 2010) and more importantly a reduced waist circumference as a marker of central obesity (Panagiotakos *et al.*, 2006; Romaguera *et al.*, 2009; Issa *et al.*, 2011), a lower incidence of the metabolic syndrome (Tortosa *et al.*, 2007; Babio *et al.*, 2009; Rumawas *et al.*, 2009; Kastorini *et al.*, 2011; Kesse-Guyot *et al.*, 2012) and of type 2 diabetes (Martínez-González *et al.*, 2008). This was stressed in a recent systematic literature survey (Sofi *et al.*, 2008).

Cancer

The data from a series of case-control studies have been systematically analysed (La Vecchia, 2004). They indicate in general that high intake of foods typical of the traditional Mediterranean dietary pattern – i.e. fruit, vegetables, whole grains, olive oil and fish – were associated with a reduced risk of developing various types of cancers. This was recently confirmed by other reviews (Sofi *et al.*, 2008; Bosetti *et al.*, 2009; Vernele *et al.*, 2010).

Neuro-degenerative diseases

Although fewer studies have as yet been conducted on Parkinson's or Alzheimer's disease, the risk of contracting these diseases has been shown to be lower in persons adhering well to a traditional Mediterranean dietary pattern (Sofi *et al.*, 2008). The Mediterranean Diet may positively affect the aging process through the reduction of the prevalence of cardiovascular and chronic diseases and, in particular, the evolution of cognitive decline related to Alzheimer's and vascular dementia (Féart *et al.*, 2010; Tyrovolas and Panagiotakos, 2010; Martínez-González *et al.*, 2009).

Mortality

The beneficial effects of a Mediterranean dietary pattern on reducing mortality have long been recognised (Trichopoulou *et al.*, 1995 and 2003) and a recent study has clearly demonstrated that the main food components of this diet all play a role in the process (Trichopoulou *et al.*, 2009). This provides an objective basis for the concept that the overall dietary pattern is effective in improving health status by integrating the positive metabolic effects of this variety of typical Mediterranean foods.

It should be mentioned in support of all of these diet-health connections that recent studies have clearly underlined the nutritional quality of a Mediterranean dietary pattern. One survey demonstrated that subjects who adhere closely to a Mediterranean Diet pattern fulfil most mineral and vitamin requirements much better than persons on a western diet (Serra-Majem *et al.*, 2009). Computer-assisted modelling of individual diets has identified that the most important foods that enable people to fulfil all present nutritional requirements (except Vitamin D) are those typical of the Mediterranean dietary pattern i.e. nuts, unrefined grains, legumes, fish and vegetables (Maillot *et al.*, 2010 and 2011).

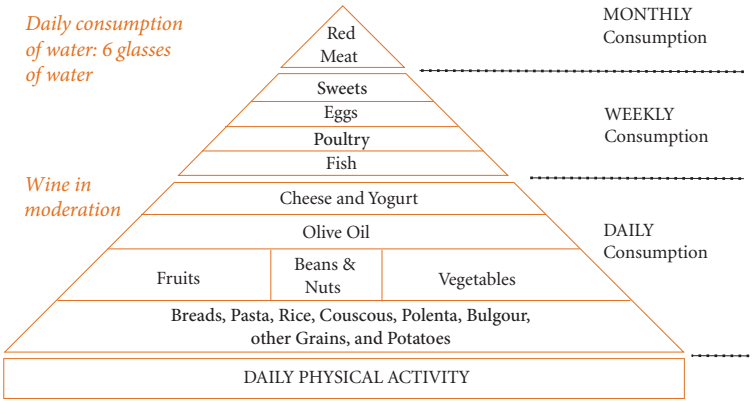
Mediterranean Diet pyramids

The Mediterranean Diet is rich in plant foods (cereals, fruit, vegetables, legumes, tree nuts, seeds and olives), with olive oil as the principal added fat source, along with high

to moderate intake of fish and shellfish, moderate to low consumption of eggs, poultry and dairy products (cheese and yoghurt), low consumption of red meat (mainly mutton and goat), pastries and saturated fat, and moderate intake of alcohol mainly in the form of wine during meals. It was also the diet chosen by mainly poor rural societies.

This healthy traditional Mediterranean dietary pattern has been popularised through a pyramid representation, which graphically highlights the foods to be consumed on a daily or weekly basis or less frequently. The first traditional Mediterranean Diet pyramid was presented in 1993 at the international conference on Mediterranean Diets held at the Harvard School of Public Health in Boston (Willett *et al.*, 1995), and it was compared to the 1992 food guide pyramid issued by the US Department of Agriculture in preparation for the 1995 Dietary Guidelines for Americans. Then, in 1994, it was copyrighted by Oldways Preservation & Exchange Trust (see Figure 1) (Willett *et al.*, 1995).

Figure 1 - The Mediterranean Diet pyramid, 1993



Source: International Conference on Mediterranean Diets, Boston, 1993; Copyright by Oldways Preservation & Exchange Trust, 1994.

Since then, various Mediterranean Diet pyramids have been designed for the populations of Greece (Supreme Scientific Health Council, 1999), Spain (Aranceta and Serra-Majem, 2001), and Italy (Ministero della Salute-Gruppo di lavoro, 2004), tailored to their various food habits. These refer diversely to portion sizes and frequency of consumption – daily, weekly and monthly – but are not standardised. On the other hand, current versions of the Mediterranean Diet pyramid are inappropriate for the Middle East and North African countries and others. This is important to ensure cultural appropriateness and also allow for the development and transmission of culinary and traditional eating habits.

In 2008, the Oldways Preservation & Exchange Trust convened the 15th Anniversary Mediterranean Diet Symposium in Cambridge (MA) and issued a new updated version of the Mediterranean Diet pyramid (Oldways Preservation & Exchange Trust, 2009). This pyramid was again copyrighted by the Oldways Preservation & Exchange Trust in 2009.

Following many discussions and numerous reservations expressed by members of the Mediterranean scientific community in response to this new copyrighted Med diet

pyramid, the Mediterranean Diet Foundation together with the Forum on Mediterranean Food Cultures promoted dialogue among international experts and launched the process of gathering scientific opinion in order to develop a consensus on a new revised Mediterranean Diet pyramid representation. The new revised MD and food lifestyle pyramid (as a scheme) is the outcome of the internal dialogue within the scientific community and further discussions at the international conference organised by the Interuniversity International Studies Center on Mediterranean Food Cultures (CIISCAM) in November 2009 on "*The Mediterranean Diet as a Model of Sustainable Diet*". It was at that meeting that a first international consensus was reached on a new revised modern Mediterranean Diet pyramid, without any copyright, (see Figure 2) (CIISCAM, 2009).

The following topics were discussed: i) the consumption of fresh, minimally processed, local and seasonal foodstuffs, ii) the balance between energy-dense and nutrient-dense foods in relation to reduced energy expenditure and the obesity epidemic, iii) the availability, sustainability, accessibility and cost of recommended foods, iv) adaptation to various geographical, socio-economic and cultural contexts.

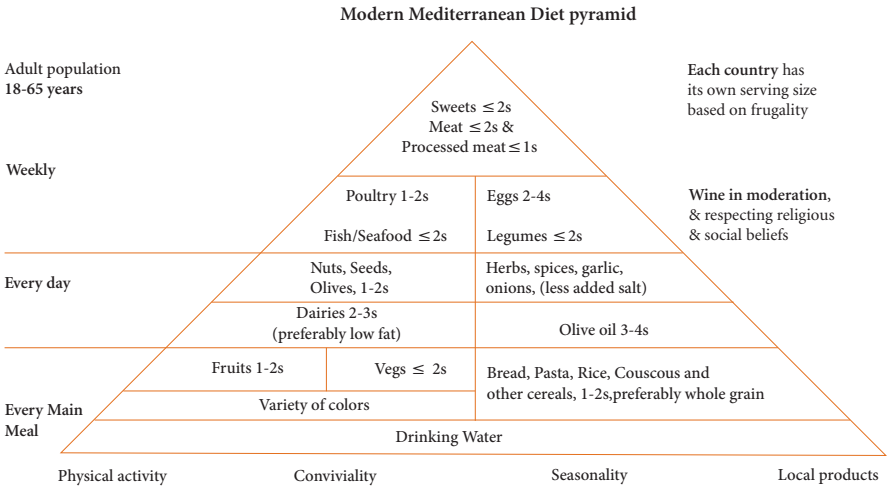
At the Eighth International Congress on the Mediterranean diet held in Barcelona in 2010, the 2009 Mediterranean diet pyramid was further revised, redesigned and complemented with an informative text by the International Scientific Committee of the Mediterranean Diet Foundation (see Figure 3) (Bach-Faig *et al.*, 2011). The traditional Mediterranean Diet (MD) pyramid has thus been updated to adapt to contemporary lifestyles (Figures 2 and 3).

The modern Mediterranean diet pyramid has been developed by taking into consideration all scientific evidence for the health benefits of the Mediterranean diet and its protective effect against chronic diseases, as well as contemporary lifestyles and environmental constraints. Experts in nutrition, anthropology, sociology and agriculture have been involved in this new richer model, which addresses the healthy adult population, and should be adapted to specific requirements in the case of children, pregnant women and other health circumstances.

The new pyramid (Figures 2 and 3) follows the previous pattern: at the base, foods that should sustain the diet, and at the upper levels, foods to be eaten in moderate amounts. Furthermore, qualitative elements concerning social and cultural features of the Mediterranean lifestyle are also incorporated. It is not just a matter of prioritising certain food groups, but also of paying attention to how food is cooked and eaten. The pyramid also reflects and introduces the concept of the composition of main meals.

The pyramid establishes dietary guidelines regarding daily, weekly and occasional consumption with a view to following a healthy and balanced diet. An intake of 1.5 to 2 litres of water per day is recommended as well as main meals consisting mainly of three basic food groups: cereals (one or two servings), fruit (one or two servings), and vegetables (at lunch and dinner, two servings or more). Vegetables, fruit and minimally refined cereals are situated together at the base of the pyramid to minimise energy intake. Fruit and vegetables of different colours should be eaten to provide a diversity of antioxidants and protective compounds. Olive oil is placed at the centre because, in the Mediterranean Diet, it is the principal source of dietary lipids and research has documented its high

Figure 2 - The Mediterranean Diet pyramid, 2009



Source: Third International CIISCAM Conference, Parma, Italy, 2009.

Figure 3 - The Mediterranean Diet pyramid, 2010

Source: Eighth International Congress on the Mediterranean Diet, Barcelona, 2010.

nutritional quality and health benefits. Oleic acid is also the major fatty acid present in adipose tissue, where it may function as an antioxidant (Berry, 1997).

Furthermore, plant foods should form the core of the food pattern in general, since they provide key nutrients and protective substances that contribute to general well-being and serve to maintain a balanced diet. Spices, herbs, garlic and onions are present to introduce flavour and contribute to salt reduction. Reasonable consumption of olives, nuts and seeds (such as a handful) makes a healthy snack choice. Dairy products are recommended preferably in the form of low-fat yoghurt and cheese. And moderate consumption of wine during meals is also recommended depending on religious and social customs.

A variety of plant and animal proteins should be consumed. The frequency with which these sources of protein are recommended on a weekly basis: fish (two or more servings), legumes (more than two servings), white meats (two servings) and eggs (two to four servings). Red meat (less than two servings, preferably lean cuts) and processed meats (less than one serving) should be eaten in smaller quantities and less frequently. The pyramid also gives a weekly recommendation for potatoes, preferably fresh potatoes.

Foods situated at the upper levels such as animal foods, which have a high sugar and fat content, should be eaten only in moderation and on special occasions. The incorporation of lifestyle and cultural elements together with the proportion and frequency recommendations is one of the innovations of the pyramid. If all the benefits of the Mediterranean Diet are to be obtained, a healthy lifestyle should be adopted and certain cultural elements should also be preserved. These elements are:

- *Moderation:* in order to combat the obesity pandemic, portion sizes should be based on frugality, thus adapting energy intake to modern urban and sedentary lifestyles. It is recommended that each country recommend its own serving sizes.
- *Conviviality:* the conviviality aspect is important for the social and cultural value of a meal, over and above the nutritional aspect. Cooking, sitting around the table and sharing food in the company of family and friends provides social support and creates a sense of community.
- *Cooking:* it is stressed that cooking should be regarded as an important activity, particularly when there are children, and that the proper time should be taken. Cooking can be relaxing and fun and can be done with family, friends and loved ones.
- *Seasonality, biodiversity, eco-friendliness, and traditional and local food products* are presented at the bottom of the pyramid to highlight how the new revised modern Mediterranean Diet is compatible with the development of a sustainable diet model for present and future Mediterranean generations.
- *Physical activity:* regular exercise of moderate intensity (at least 30 minutes per day) is recommended as a basic complement to the diet in order to balance energy intake and maintain healthy body weight and as a source of many other health benefits. Walking, taking the stairs rather than the lift, housework, etc, are simple and easy ways of doing exercise. Practising leisure activities in the open air and preferably with others makes it more enjoyable and strengthens the sense of community.

The new pyramid is the result of international consensus and is based on the latest scientific evidence in the field of health and nutrition published in hundreds of scientific articles in the last few decades, thus contributing to the harmonisation of educational tools used in the promotion of the Mediterranean Diet, and responds to the need for a common framework among Mediterranean countries. The use and promotion of this pyramid is recommended without restriction and the 2010 updated edition 2010 (see Figure 3) has been adapted, translated and edited in ten different languages (English, Spanish, Catalan, Galician, Euskera, French, Arabic, Italian, Portuguese and Greek) by the Mediterranean Diet Foundation in collaboration with several International Organisations.

Conclusion

The traditional Mediterranean Diet is the heritage of millennia of exchanges amongst the peoples and cultures of the Mediterranean Basin. It formed the basis of eating habits throughout the region until the mid twentieth century, but it is now gradually being lost due to the spread of the western-type economy and urban and technological society as well as the globalisation of production and consumption.

Conceived as a constantly evolving lifestyle, the Mediterranean Diet is a complex system of shared knowledge relating to health, food, cultures and people; it is the product of a particular environment, a geographical region of multiple facets and rich history, which conserves traditional knowledge and a diversity of foods and diets. Thought must therefore be devoted to how the perception of the Mediterranean Diet can be modified, so that it is seen not only as a healthy dietary pattern that reduces mortality and morbidity but also as a model of a Mediterranean lifestyle of well-being, with country-specific and culturally appropriate versions for each Mediterranean country. The southern Mediterranean countries are undergoing transition, however, in the areas of health and nutrition. Their populations are suffering from under-nutrition as well as chronic nutrition-related diseases, which are increasingly leading to disabilities and death. The data reported on this region show that there is a shift in dietary habits from a traditional Mediterranean Diet to industrial food, which could explain in part the nutritional and metabolic disorders reported in the region's population. Unhealthy eating practices in the southern Mediterranean countries include high consumption of saturated fats and refined carbohydrates, low consumption of fiber, and sedentary behaviour (Belahsen and Rguibi, 2006).

As a result, and given the current changes in the food production system and globalisation, the sustainability of the Mediterranean Diet is becoming questionable. Urgent action must therefore be taken in the field of public health and nutrition policy to counteract dietary westernisation and to preserve the healthy Mediterranean food consumption pattern from increasing erosion (da Silva *et al.*, 2009).

Based on a traditional variety of diverse local foods which are integral to the Mediterranean environment, the Mediterranean Diet is still an under-explored resource for biodiversity and nutrition in the context of food and nutrition security in the region. More than just a dietary pattern, it is a potential model for effective sustainable development in the Mediterranean Basin.

New research projects and studies on the Mediterranean Diet as an example of a sustainable diet, in which nutrition, biodiversity, local food production, local culture and sustainability are closely interconnected, should be encouraged and supported and the dissemination of the results should be promoted. New cross-cutting, intersectoral case studies need to be developed in order to demonstrate the synergies of biodiversity, nutrition and sustainability contained in the Mediterranean Diet for the benefit of present and future generations. It is thus strongly recommended that this diet be developed throughout the region.

Although the Mediterranean Diet is recognised as one of the healthiest diets in the world and has been acknowledged by UNESCO as an intangible cultural heritage of humankind and by the FAO as an example of a sustainable diet (FAO, 2010; Burlingame and Dernini, 2011), it is being progressively eroded. Urgent measures are therefore needed to halt that erosion, particularly amongst the younger generations, who form the majority of the populations in the southern Mediterranean countries.

The authors wish to acknowledge the critical contribution of Prof. Carlo Cannella to this paper, who sadly died on 23 February 2011.

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