The Mediterranean Diet

Health and Science

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Preface

This book is an introduction to the health benefits of the Mediterranean diet (MedDiet), and the epidemiological and experimental evidence that underpins these benefits. The book is mainly intended for dietitians and nutritionists, and will also be of interest to other health workers, food scientists, and students taking courses in biomedical sciences.

The MedDiet is best known for helping prevent cardiovascular diseases (CVDs) and, to a lesser extent, cancers, and these are discussed in detail. In addition, we discuss the increasing evidence that the MedDiet can help prevent other chronic degenerative diseases such as neurodegenerative disorders and metabolic syndrome. With the ageing of populations, these diseases have become the major cause of morbidity and mortality in both developed countries and many less-developed countries. This highlights the growing importance of nutrition in helping prevent these diseases, and the book concludes with a discussion of public health strategies that can facilitate implementing a MedDiet in the community, and so help increase the number of years that people live in good health.

Several chapters in the book discuss experimental evidence that contributes to understanding how the MedDiet works. In particular, we have discussed common disease mechanisms that underlie many chronic diseases, and how, by targeting these mechanisms, key nutrients in the MedDiet can help prevent a broad range of diseases. These key nutrients probably include various plant chemicals (phytochemicals), some vitamins, fibre and fatty acids. The levels of these nutrients – in Mediterranean foods as elsewhere – are influenced by many steps of the food chain, from food production to metabolic effects in the body. Hence, we have highlighted features of the food chain that can have a significant impact on levels of these nutrients and hence impact on the overall health benefits of a MedDiet. For example, phytochemical levels are influenced all along the food chain from decisions regarding plant cultivar selection, to the growth conditions of the plant, food preparation and metabolic effects in the body. Similarly, the feed of land animals and fish has a major impact on their fatty acid composition and hence this impacts on human nutrition as well.

Throughout the book we have emphasised the importance of considering the composition of the MedDiet in its totality, i.e. as a Mediterranean "dietary pattern", rather than as a collection of individual foodstuffs. This is because both epidemiological evidence and – increasingly – underlying experimental studies, support the notion that the food groups (such as plant foods, fish and olive oil) comprising the totality of a MedDiet interact for optimum health. In fact, even this perspective is probably insufficient, since many other aspects associated with a traditional Mediterranean lifestyle can influence health. Best recognised of these is physical activity, but other features such as social eating, regular meal structure, sunlight, and even taking a

siesta, may contribute to the benefits of a MedDiet. By discussing these aspects, we hope to provide something of a counter-balance to some current nutritional trends which are promoting individual "superfoods" or "nutraceuticals" as strategies for reducing chronic degenerative disorders.

Research on the MedDiet is proceeding at a very rapid pace, and we have highlighted promising new areas of experimental research, some of which may in the future lead to a deeper understanding of the scientific basis of the MedDiet. What is evident even now is that the MedDiet is very much a diet for our times, both through its potential for improving the health and well-being of an ageing society, and its low environmental impact by eschewing the consumption of large amounts of meat from intensively raised animals and instead favouring foods, both plant and animal, produced under more natural conditions. These features promote a healthy attitude towards food, and help make the MedDiet very appealing to a large number of people. And its delicious tastes help ensure high levels of compliance amongst consumers.

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1 Overview

Summary

- Olive oil is the main dietary fat in the Mediterranean diet (MedDiet), and there is high consumption of fruits, vegetables, unrefined cereals and legumes, moderate consumption of fish, dairy products and wine, and low consumption of meat.
- There are many variations of the MedDiet reflecting influences of culture and landscape.
- Factors such as social eating and physical activity are also important, so the MedDiet represents a whole lifestyle.
- There is strong epidemiological evidence for a protective effect by the MedDiet against cardiovascular diseases and also protection against cancers and neurological disorders. Many biologically plausible mechanisms have been developed to explain these health benefits.
- There is increasing evidence that the health benefits are best explained by considering the overall dietary pattern.
- Consumption of the MedDiet is decreasing in some Mediterranean countries, whereas consumption of Mediterranean foods in some North European countries is increasing.

1.1 Development of the MedDiet

The Mediterranean diet (MedDiet) is tasty, easy to prepare and extremely healthy. The ability of the MedDiet to help prevent a wide range of today's most common ailments has been confirmed in numerous studies, and more widespread implementation of a MedDiet would undoubtedly result in significant public health benefits. How has this cuisine become one of the healthiest in the world? Probably part of the answer lies in the enlightened understanding in the Mediterranean of the link between food and health. From the Ancient Greeks to the Moors onwards, the MedDiet has been developed not only for its gastronomic virtues, but also as a synonym for a complete system of life. Another important aspect of the MedDiet is related to climate. The long growing season in the Mediterranean reduces the need for complex preservation techniques, and this has permitted an emphasis on natural, seasonal ingredients. The reliance on fresh ingredients cooked from raw is probably the single most important factor in Mediterranean cuisine that helps to ensure the consumption of a balanced intake of nutrients. Many traditional cooking pots, such as the *tagine*, *paella* and *plancha*, are still widely used in Mediterranean countries

The Mediterranean Diet: Health and Science, First Edition. Richard Hoffman and Mariette Gerber.

and have given their names to classic Mediterranean dishes. Although originally developed to enhance flavour, these vessels are employed in cooking techniques that help enhance the health benefits of the food. Indeed, flavour and health are closely interlinked in any cuisine based on natural ingredients. A third factor is the dominance of the olive and the eschewing of animal products rich in saturated fat. Cooking vegetables with olive oil is the quintessential Mediterranean way of obtaining the benefits of both taste and health. Hence, the MedDiet represents a legacy of the link between Man and the Mediterranean environment that has existed since the time of the last Ice Age.

1.1.1 A brief history of the MedDiet

The land surrounding the Mediterranean sea has been the cradle for many civilisations and cultures, and the MedDiet represents one of the most significant achievements of these civilisations. Agriculture itself began with the cultivation of cereals and pulses in the Levant, a region which comprises the Eastern Mediterranean countries of Lebanon, Israel, Palestine, Syria, Jordan and Iraq. Later, the Phoenicians, Greeks and Romans cultivated the three basic elements of the MedDiet: olive trees for producing olives and olive oil, wheat for making bread, and grapes for fermenting into wine. These colonisers of the Mediterranean basin then spread olives and grapes to the Western Mediterranean. A wide range of vegetables were already being consumed by the time of the Romans including onions, leeks, lettuce, carrots, asparagus, turnips, cabbage, celery and artichokes. Among the fruits consumed by this time were figs, apples, pears, cherries, plums, peaches, apricots and citrons (a type of citrus fruit). Chestnuts, almonds and walnuts were also eaten [1, 2].

Important developments in the MedDiet occurred from the 8th century when the Moors occupied much of the Iberian peninsula (calling the region al-Andalus). The Moors introduced rice, lemons, aubergines (American: egg plants), saffron and other spices, and these products then spread, to varying extents, throughout the Mediterranean basin. The Moors had a particularly enlightened awareness of the importance of diet for general health. For them, 'diet was a synonym for a system of life. It included the practice of eating correctly, of choosing the best places for staying healthy and lengthening one's life, of bathing and washing correctly, of sleeping and staying awake, of expelling useless substances from one's body and of dealing with the ups and downs of the spirit' [3]. The occupation by the Moors ended in 1492, and this was the same year that Christopher Columbus arrived in the New World. Columbus returned to Spain with tomatoes and bell peppers, and these are now an integral part of the MedDiet.

1.1.2 The traditional MedDiet and present day MedDiets

The term 'Mediterranean diet' was originally coined in the 1950s by Ancel Keys, the epidemiologist who first recognised the health benefits of this way of eating. Since then, the MedDiet has undergone many changes, and it is now convention to use the term 'traditional' MedDiet to indicate the type of diet that could be found in rural communities in the 1950s and early 1960s, especially in Southern Italy and Greece (and rural Crete in particular), and before the impacts of migrations to the towns, rising wealth and modern food technologies. The traditional MedDiet was shaped by terrain and climate. Cereals and vegetables were grown in the flatter,

low-lying areas, vines and olive trees on the slopes, and higher ground was left for grazing sheep and goats. The Cretan diet up until the 1960s has been described as 'olives, cereals, grains, pulses, wild greens, herbs and fruits, together with limited quantities of goat meat and milk and fish ... no meal was complete without bread ... olives and olive oil contributed heavily to the energy intake ... food seemed to be "swimming' in oil"' [4].

There are various formulations of what is meant by the term 'traditional MedDiet', and the following list is taken from a statement issued by a working group at the MedDiet 2004 International Conference [5]:

- Olive oil as added lipid
- Daily consumption of vegetables
- Daily consumption of fruits
- Daily consumption of unrefined cereals
- Bi-weekly consumption of legumes
- Nuts and olives as snacks (generally eaten just before a meal)
- Bi-weekly consumption of fish
- Daily consumption of cheese or yogurt
- Monthly or weekly consumption of meat or meat products
- Daily moderate consumption of wine, if it is accepted by religion and social grounds

Although this list sums up most of the important aspects of a traditional MedDiet, other versions include consumption of herbs and spices, herbal teas, and wild greens gathered from the countryside, and also the importance of significant levels of physical activity.

The traditional MedDiet is a rich source of macronutrients and micronutrients. It is not possible to define the precise amounts of various beneficial nutrients in the MedDiet because of significant variations between countries (see below). However, one set of figures, based on an analysis of a traditional Greek diet, is shown in Table 1.1.

Fats are an important component of the traditional MedDiet, and account for about 30% of total calories in Spain, and up to about 40% of total calories in Greece [7] This compares with about 34% in the American diet [8]. Hence, the traditional MedDiet is not a low fat diet. There are, however, significant differences in the fatty acid composition compared to a North European or a North American diet. This is mainly due to the fairly low level of saturated fats in the MedDiet (7–8% of total calories), and relatively high consumption of monounsaturated fatty acids (MUFAs) (>20% of total calories), which is mostly oleic acid derived from olive oil. Not only are total saturated fats relatively low in a traditional MedDiet, but the types of saturated fatty acids (SFAs) consumed are quantitatively different to those in a North European diet. This is partly because consumption of SFAs from meat and cow's milk is relatively low, and consumption of SFAs from cheese and yogurt made from goat and sheep milk can be quite high. Goat and sheep milk contain a relatively high percentage of medium chain fatty acids (MCFAs) compared to cow's milk, and these are not as strongly associated with adverse effects on plasma cholesterol levels as some longer chain SFAs. The Greeks have one of the highest consumption of cheese in the world – at 26 kg per person per year (2005 figures) it is even higher than for the French! But about half of this is feta, a cheese traditionally made with ewe's milk and up to 30% goat milk.

Table 1.1 Estimated daily intake of macro- and micronutrients in a Greek MedDiet [6]. Reproduced with permission. © 2006 Elsevier.

Component	Daily intake
Macronutrients	
Protein	74.5 g
Carbohydrates	255.8 g
Dietary fibre	29.8 g
Ethanol	14 g
Total lipids	110.7 g
SFA	29.8 g
MUFA	63.8 g
PUFA	9.9 g
TFA	1.4 g
Phytochemicals	
Flavonoids	118.6 mg
Carotenoids	65.7 mg
Sterols	256.8 mg
α-tocopherol	4.3 mg
Inorganic constituents	
K	1774 mg
Fe	14.9 mg
Na	2632 mg
Ca	696 mg
Mg	234 mg
Zn	10.3 mg
Cu	3.8 mg
Mn	3.5 mg
Total energy value	2473 Kcal

SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; TFA, trans fatty acids.
Note: There were no data on vitamins in this analysis.

The traditional MedDiet is also a good source of polyunsaturated fats (PUFAs). Fish is the main contributor of the long chain (LC) *n*-3 FAs eicosapentaenoic acid (EPA) (20:5 *n*-3) and docosahexaenoic acid (DHA) (22:6 *n*-3). There is a modest intake of the *n*-6 fatty acid linoleic acid from nuts and sunflower seeds and pumpkin seeds, and these are popular aperitif foods in some Mediterranean countries. Linoleic acid is the predominant fatty acid in many seeds such as sunflower seeds and corn, and hence in oils made from these seeds. Seed oils are not a significant part of the traditional MedDiet and, as a consequence, *n*-6 fatty acid consumption is lower than in North Europe and North America. However, it should be mentioned that corn oil and sunflower oil are now increasingly replacing olive oil for cooking in some Mediterranean countries due to their lower cost.

Fats in the MedDiet

- High consumption of MUFAs, particularly oleic acid from olive oil
- High consumption of LC *n*-3 PUFAs (α-linolenic acid – ALA, EPA and DHA)
- Relatively low consumption of *n*-6 PUFAs
- Relatively high consumption of SCFAs and MCFAs from goat and sheep milk

Table 1.2 Estimate of the macronutrient composition of a typical MedDiet and a typical western diet (data from [9]).

Macronutrients	Mediterranean diet (%)	Western diet (%)
Carbohydrates	47	42
Proteins	15	20
Saturated fats	10	17
Monounsaturated fats	22	14
Polyunsaturated fats	6	7

Besides its typical fat composition, the MedDiet is also a rich source of a variety of carbohydrates, and these are discussed in Chapter 2. One estimate of how the overall proportions of macronutrients in a 'typical' western diet compare with those in a 'typical' MedDiet is shown in Table 1.2 [9]. This estimates MUFA intake in the MedDiet at 22% compared to 14% in a typical 'Western' diet. Although this analysis estimates that total PUFA intake between the two diets is similar, it should be noted that this analysis did not distinguish between *n*-6 and *n*-3 PUFAs.

Due to the high consumption of plants foods, the traditional MedDiet is a particularly rich source of plant chemicals (phytochemicals) and some vitamins and minerals (see Table 1.1). One aspect of particular relevance here is that plasma folate levels have been found to be a good biomarker for adherence to the MedDiet [10]. This mainly reflects the high consumption of green leafy vegetables in the MedDiet. Folate consumption is linked to a wide range of beneficial effects in the body, including prevention of neural tube defects in early pregnancy, and protection against cancers of the pancreas, oesophagus and colon-rectum [11]. By contrast, folic acid given in supplements has been shown to promote the progression of pre-malignant colorectal lesions [12]. This illustrates the increasing evidence that micronutrient supplements may not always afford the same protective effects attributed to dietary sources. This is an important point in the debate between whole diets and the use of supplements, and is discussed further in later chapters.

Although a traditional MedDiet is still widely consumed, especially by more elderly people, the diet is now increasingly under threat. Protecting healthy traditional diets against the encroaching uniformity of food, particularly the influence of fast food, is now recognised as a high priority [6]. Consequently, there was an initiative by Spain, Italy, Greece and Morocco to help protect the traditional MedDiet by applying for it to be adopted by UNESCO's Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage of Humanity [13]. The MedDiet achieved this recognition in November 2010. The box below gives the statement issued by UNESCO at the time of this recognition, and emphasises how much the MedDiet represents an overall lifestyle rather than just the consumption of food.

UNESCO DECLARATION ON THE MEDITERRANEAN DIET AS AN INTANGIBLE CULTURAL HERITAGE OF HUMANITY

http://www.unesco.org/culture/ich/index.php?lg=en&pg=00011&RL=00394

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