How a Gastroenterologist Interprets the Mediterranean Diet

2

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2.1 Origins and Definition of the Mediterranean Diet

Mediterranean diet has become a popular expression that is widely used by expert and lay people, even though actually not always appropriately.

The Mediterranean diet is not a vegetarian diet, although plant foods have their relevance; not the diet of bread and pasta, even if the consumption of cereals represents an important component; not a diet of "poor nutrients" but rather a genuine diet based on the so-called functional foods; not the grandmother's soup, since it is also a rich culinary heritage of recipes, smells, and tastes; not a trendy diet, because of its historical roots and evidence-based benefits; and not the diet that allows one to lose or gain weight as it relates to food's quality and not to its energy content.

The traditional Mediterranean diet is the diet consumed by the people living in the Mediterranean area in the 1950s and 1960s, immediately after World War II. Rather than being simply a way of eating, it is a body of knowledge, social customs and cultural traditions historically handed down by populations bordering the *Mare Nostrum*. Then, more than a restrictive or limiting regime, we should define it as a "lifestyle" whose importance has been recognized worldwide by UNESCO, which in November 2010 recognized the Mediterranean diet as "intangible heritage

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of humanity." The decision is based on the recognition that "this simple and frugal way to have meals favored over time intercultural contacts and conviviality, creating a formidable corpus of knowledge, social customs and traditional celebrations of many populations of the Mediterranean."

A single definition of the Mediterranean diet is not easy because of the coexistence of many countries, different cultural backgrounds, ethnic and religious roots, social and economic status, as well as agricultural productions involving different food choices in the area. In other words, there is no single "Mediterranean diet," but a common "Mediterranean dietary pattern" characterized by the following main features [1, 2]:

- High intake of plant foods (vegetables, fresh and dried fruits, legumes, bread and pasta from not reconstituted whole-wheat flour, and other cereals such as barley, spelt, and oats which assure both a low glycemic index and a stabilizing and filling role).
- Main consumption of fresh and seasonal products, mostly locally produced.
- The use of olive oil as the main source of dietary fat.
- Moderate intake of fish, poultry, and free-range eggs, eaten few times a week.
- Daily but moderate consumption of cheese and yogurt produced with milk from grazing animals, rich in omega-3 fatty acids and antioxidant vitamins.
- Low intake of red and processed meats which were eaten only on Sundays in the wealthiest families and occasionally in the less affluent families.
- Regular use of aromatic herbs determining good taste and palatability and reducing the excessive use of salt and fat ingredients.
- Wine in moderation, consumed with meals.
- Low intake of sweets, which were prepared only during family and religious celebrations.

The nutrients contained in foods are therefore:

- Few proteins, mainly of vegetable origin.
- Carbohydrates with low glycemic index and glycemic load and simple sugars almost absent.
- High monounsaturated-to-saturated fatty acid ratio.
- Much greater amount and ratio between omega-3 and omega-6 than in our current alimentation which is close to 1:1.
- Abundant use of beta-carotene, tocopherols, and vitamin C.
- High polyphenols (which make the Mediterranean diet as a *functional diet*).
- High calcium, magnesium, and potassium.
- Low sodium.

The Mediterranean diet is also a predominantly "raw food" diet: almost all dishes are cooked at low temperatures for a long time, while many foods and seasonings, in particular olive oil, are added raw to dishes, becoming also a diet low in AGEs (advanced glycation end products) [3]. An extensive literature indicates

that AGEs are dangerous molecules for our organism because their effects, being related to inflammation and aging, are involved in the pathogenesis of many degenerative diseases [4]. AGEs are the products of the later stages of the nonenzymatic glycation of proteins. This phenomenon occurs in the organism as well as in foods subjected to special physicochemical treatments (e.g., high temperatures and low humidity). Then, the total amount of AGEs has both an endogenous and a dietary origin that contributes to the progressive accumulation of AGEs in tissues. Almost all food produced through industrial processes are very rich in AGEs not only for the high temperature but also for the manufacturing methodologies used, capable of altering the chemical nature of the substances involved. Even in the home environment, it is possible to treat foods so that they contain a greater or lesser amount of glycation products: scorching, roasting, or toasting leads to the production of AGEs.

2.2 The Origins of Research

The authorship of the research on the Mediterranean diet can be attributed to the nutritionist Lorenzo Piroddi (1911–1999), who in 1939 suggested the connection between diet and onset of metabolic diseases. To treat his patients, Piroddi developed a first version of the Mediterranean diet, limiting the consumption of animal fats in favor of vegetable fats.

Nevertheless the first researcher who brought the concept of the "Mediterranean diet" to the attention of the scientific world was Ancel Keys (1904–2004), expert in epidemiology and nutritionist at the School of Public Health, University of Minnesota, who coincidentally realized the health benefits of this food style during World War II.

In the 1940s, Keys was in Crete in the wake of the allied troops and noted that the incidence of cardiovascular diseases in that island was considerably lower than in the United States. In 1944, landed at Paestum in the wake of the Fifth Army, he was struck by the eating habits of the population living in the Cilento region and developed the intuition that the low incidence of cardiovascular diseases in the two populations was due to the food type that they adopted for secular tradition. He was so convinced of the goodness of the dietary traditions and way of life of southern Italy and other Mediterranean countries that he moved with his family to Pioppi, a small town of the Cilento region.

During his stay he observed that the usual food of the farmers living in the small countries of southern Italy was low in fats of animal origin (as they rarely ate meat, unlike rich people that consumed it almost every day) and rich mainly of bread, different types of pasta often consumed with vegetables, legumes used for soups, seasonal fruits and vegetables available in their gardens, extra virgin olive oil, and often also cheese and dried fruit when available, integrated with wine. Food choices were dictated by poverty, frugality, and parsimony, but the farmers from Cilento and Crete lived longer and had a low prevalence of cardiovascular diseases compared to the citizens of northern Europe and the United States and even their own relatives

emigrated in previous years, despite the high consumption of olive oil (vegetable fats) giving not less than 40 % of total daily energy.

These observations led Keys to start the famous "Seven Countries Study," an epidemiological study involving the following seven countries: Finland, Japan, Greece, Italy, the Netherlands, the United States, and Yugoslavia. The survey compared lifestyle and diets adopted by the different populations, and Italy was represented by the small towns of Nicotera (Calabria), Crevalcore (Emilia), Montegiorgio (Marche), and Pioppi (Cilento) [5]. The results confirmed the relationship between diet and incidence of some diseases, clarifying in particular that the type and not the quantity of fat used had a major influence on cardiovascular diseases. Among the populations of the Mediterranean area, the mortality rate from ischemic heart disease was much lower than in countries such as Finland and the United States where the daily diet included a lot of saturated animal fats (butter, lard, milk, cheese, red meat).

The conclusion of this research led Ancel Keys to define the Mediterranean diet as the best "*life style*" allowing a better and longer life and making it popular worldwide.

In his 1975 book *How to Eat Well and Stay Well the Mediterranean Way* and more recently in a presentation at the first Congress on the Mediterranean Diet held in Boston in 1993, under the patronage of two famous devotees of the Mediterranean diet, Dimitrios Trichopoulos and his wife Antonia Trichopoulou, Ancel Keys described the Mediterranean diet as follows [6]:

> "The heart of what we now consider 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 down with wine. No main meal in the Mediterranean countries is replete without lots of verdure (greens). Mangiafoglia is the Italian word for "to eat leaves" and that is a key part of the good Mediterranean diet. In fact, the best Mediterranean we associate with health is almost vegetarian (or lactovegetarian) because cheese is and always has been a part of this diet."

The Mediterranean diet is quantitatively defined in different ways, especially through the techniques of the food pyramid and the Mediterranean adequacy indexes.

The most representative food pyramids of the Mediterranean diet are the American pyramid [7], developed by Walter Willett at the Harvard Medical School of Public Health in collaboration with Oldways, and the Greek pyramid influenced by the leadership of Antonia Trichopoulou and her husband Dimitrios, respectively, professor in Athens and professor of epidemiology at Harvard.

The Harvard pyramid recommends:

- Daily: derivatives of whole grains, vegetables, legumes, fruits, nuts, olive oil, cheese, and yogurt.
- Weekly: fish, eggs, poultry, and sweets.
- Monthly: red meat.
- Wine in moderation with meals and plenty of water.
- Daily physical activity.

This pyramid was built from the data and research available at that time on nutrition and food traditions and based on the Cretan, Greek, and Italian food traditions, populations in which the rate of chronic diseases recorded in the 1960s was the lowest in the world.

The Greek pyramid recommends the same feeding even though legumes and nuts are not provided daily but weekly.

In January 2003, Walter C. Willett and Meir J. Stampfer, professors of epidemiology and nutrition at the Harvard School of Public Health, reviewed the American food pyramid and introduced a food guide incorporating improvements designed to address many of the problems in the old pyramid [8].

They adopted an innovative approach related to the consumption of fat presumably derived from the information collected by the authors who coordinated from many years three large epidemiological cohort studies – the Nurses' Health Study, the Health Professionals Follow-Up Study, and the Physicians' Health Study – which provided a huge amount of information to evaluate the association between specific nutritional aspects and risk factors for cardiovascular events.

Willett and Stampfer sustained that total fat intake alone was not associated with heart disease risk, asserting that unsaturated fats have positive health benefits, whereas *trans* and saturated fats have opposite effects.

In particular, the Nurses' Health Study, characterized by the higher follow-up period, showed that an increased consumption of monounsaturated fatty acids, and especially polyunsaturated fats, was inversely associated with coronary heart disease risk [9]. In fact, the quintile of the population with the higher consumption of polyunsaturated fats had a risk of cardiovascular events reduced by 25 % compared to the quintile of the population with the lowest intake of the same fatty acids (RR, 0.75; 95 % confidence interval (CI), 0.60–0.92; p (trend) 0.004). On the other hand, *trans* fat intake was associated with an elevated risk of coronary heart disease (RR, 1.33; 95 % CI, 1.07–1.66; p (trend) 0.01).

Their pyramid thus recommended to include generous servings of unsaturated fats, including liquid vegetable oils, especially olive and fish oils. On the other hand, saturated fats, as butter, were maintained at the top, while *trans* fats, as margarines, did not appear at all in the pyramid, because they have no place in a healthy diet. Margarines are produced converting vegetable oils from liquids to solids by the hydrogenation reaction. During the hydrogenation process, the fatty acid structure undergoes to a geometric molecular conversion from *cis* configuration to *trans* configuration which modifies the functions and metabolism within the human body [10].

Compared to saturated fatty acids or to liquid *cis*-unsaturated fats, consumption of *trans* fats has shown to increase even more the risk of coronary heart disease, in part by raising levels of low-density lipoproteins (LDLs, the so-called "bad cholesterol"), lowering levels of high-density lipoproteins (HDLs, "good cholesterol"), increasing triglycerides in the bloodstream, and promoting systemic inflammation. Therefore, replacing lipids from animals with margarines should not be considered a correct food choice.

Willett and Stampfer also moved refined carbohydrates as white rice, white bread, white pasta, and potatoes from the base of the pyramid up to the top with a "use

sparingly" recommendation. On the other hand, they still recommended eating daily healthy carbohydrates at meals in the form of whole-grain foods, such as whole-wheat bread, oatmeal, and brown rice. The difference between whole and refined grains seems to be related to their different glycemic indexes which measure how fast and how much a food raises blood glucose levels. In fact, evidence from the Nurses' Health cohort suggested that the preferential consumption of foods with a low glycemic index is associated with a better cardiovascular prevention. Low glycemic index foods are associated to higher levels of antiatherogenic HDL cholesterol and lower plasma inflammatory markers and plasma triglyceride levels [11].

More recently, Mediterranean scientific experts and international research institutions developed the new food pyramid for the Mediterranean diet during the Third International Conference of CIISCAM (University Centre for International Studies on Mediterranean Food Cultures), held in Parma in 2009 [12]. The new pyramid, based upon the latest research in the field of nutrition and health promotion, is addressed to a healthy adult population and considers the nutritional, economic, and sociocultural changes occurred in the Mediterranean region.

To acquire all the benefits from the Mediterranean diet, the new pyramid incorporates lifestyle and cultural elements, including:

1. Physical activity: regular physical activity offers many health benefits as the balance on energy intake and healthy body weight maintenance (peasants and workers of the last decades worked manually all day long and moved mostly on foot or using nonmotorized forms of transportation).
2. Socialization: beyond nutritional aspects, the conviviality is important for the social and cultural value of the meal. Cooking and sitting around the table and sharing food with family and friends offer a sense of community.
3. Sustainability: experts suggest to prefer the consumption of seasonal and local foods promoting the short food chain and the local agriculture.

The new pyramid follows the previous pattern of foods that should sustain the diet at the base and foods to be eaten in moderate amounts or left for special occasions at the upper levels. The proportion and frequency consumption of each food group are fundamental for defining a diet as healthy or harmful. The pyramid establishes dietary daily, weekly, and occasional guidelines aimed at following a healthy and balanced diet. At every meal, a healthy adult would need to consume cereals, fruits, and vegetables (finally suggested in greater quantities than fruits) paying close attention to vary colors and textures in order to obtain the right intake of antioxidants which protect the body against free radical damage.

A daily supply of water including 1.5–2.0 l to ensure a proper hydration and to maintain a good balance of body water is strongly suggested. The new pyramid also reports two important indications: frugality, which should inspire the quantitative amount of servings, and moderation in the consumption of wine, respecting religious and social beliefs. The Mediterranean diet appears revisited in a modern key without neglecting the different cultural and religious traditions and the different national identities.

2.3 Healthy Foods from the Mediterranean Diet

Each food has beneficial effects on health when its consumption is qualitatively and quantitatively appropriate to satisfy the energetic and nutritional needs of the organism. It is to be highlighted that all meals, including breakfast, lunch, dinner, and snacks, should be balanced and contain all the nutrients we need, a goal that can be reached easily with a diet as varied as possible.

As stated, the Mediterranean diet is based on dishes where the protagonists are the following Mediterranean foodstuffs: olive oil, whole grains, fresh fruits, vegetables, fish, legumes, moderate amounts of dairy products and meat, and red wine.

2.3.1 Olive Oil

The olive oil, heart of the Mediterranean diet, is rich in monounsaturated fatty acids, in particular oleic acid (70–86%), becoming one of the best condiments to keep under control the serum concentrations of very low-density lipoprotein rich in LDL cholesterol that tends to remain in the blood and to deposit in the arteries' walls. Furthermore, the relatively high concentration of oleic acid in the phospholipids of cell membranes makes the cell less susceptible to oxidation, reducing the formation of pro-inflammatory molecules.

In 2011, the European Food Safety Authority recommended the daily ingestion of olive oil rich in phenolic compounds, such as virgin olive oil [13]. Some of these compounds, in particular flavonoids and secoiridoid, showed significant effects in the prevention of chronic diseases such as cardiovascular diseases, certain types of cancer, premature aging, and degenerative diseases of the central nervous system, explaining the health benefits of virgin olive oil in addition to the oleic acid content. Olive oil is not only important for its intrinsic properties but also because it replaces other fats used in the extra-Mediterranean kitchen, such as those of animal origin (lard or butter) or from vegetable oils of lower quality. However, it is noteworthy that it still remains a fat and that all fats, irrespective of other nutritional characteristics, have the same caloric intake.

2.3.2 Cereals

Cereals are a vital element of the Mediterranean diet and occupy the base of the food pyramid together with vegetables and fruit. Cereals include corn, barley, rice, wheat (soft and hard wheat), and spelt. They are an important source of food energy provided as starch, a polysaccharide which yields glucose after digestive process. They are also a good source of proteins. According to the Whole Grains Council, bran, germ, and endosperm must be present to qualify grains as whole grains which are rich in vitamins, minerals, dietary fiber, and other bioactive compounds.

Whole grains may be eaten whole, cracked, split, flaked, or ground. Most often, they are milled into flour and used to make breads, cereals, pasta, and other grain-based foods.

Until the last century grains were commonly eaten as whole grains. Advances in the milling and processing of grains allowed large-scale separation and removal of the bran and germ, resulting in refined flour that consists only of the endosperm or in recombined flour which may be composed of white flour and bran originating from different batches of the grain. However, current dietary recommendations suggest to substitute refined grains with whole grains, because many of the beneficial bioactive components intrinsic to whole grains are lost during the refining process.

Current epidemiological evidence indicates that whole grains have a beneficial effect on health; foods from whole grains substantially reduce the risk of cardiovascular disease, diabetes, and cancer and play a role in weight management and digestive health. The essential macro- and micronutrients and the phytonutrients found in grains synergistically contribute to their beneficial effects.

The inverse association between intake of whole grains and cardiovascular disease has been demonstrated in a meta-analysis that evaluated seven cohort studies and found that higher intake of whole grains (2.5 compared to 0.2 servings per day) was associated with a risk lower than 21 % of cardiovascular events. In contrast, there was no association with the intake of refined grains [14]. In another recent meta-analysis, the whole-grain consumption did not show any effect on body weight change and a small effect on the percentage of fat mass [15].

A recent meta-analysis of 25 prospective studies confirmed a lower colorectal cancer risk, for an increase of three servings a day of whole grains [16]. The nutritional components of whole grains, which improve the health status and prevent chronic degenerative diseases, include tocotrienols, lignans, and phenolic compounds, as well as anti-nutrients such as phytic acid, tannins, and enzyme inhibitors.

2.3.3 Fresh Fruits and Vegetables

They are low energy density foods with a high content of fiber, water, vitamins, and minerals. Dietary fiber found in fruits and vegetables increase the distension of the stomach and consequently the sense of satiety which leads to not exceed in the consumption of other types of foods with higher calorific value. The portions of fruits and vegetables consumed per day should be five. The habit to eat regularly seasonal fruits and vegetables reduces the risk to take them with the harmful substances used in agriculture and preserves the biodiversity, ensuring higher organoleptic qualities.

2.3.4 Fish

Fish consumption has shaped and determined the history of the countries bordering the Mediterranean Sea. It is an excellent source of proteins, vitamin D, long-chain omega-3 polyunsaturated fatty acids, and some mineral salts such as selenium, phosphorus, and potassium that regulate the exchange of substances through the cell

membranes. In particular, fishes contain the docosahexaenoic acid and the eicosapentaenoic acid, defined as essential fatty acids because our body is not able to produce them, and they must necessarily be included in the diet. Omega-3 fatty acid consumption has been shown to decrease the risk of coronary heart disease, hypertension, atherosclerosis, and thrombosis because of their antithrombotic effects that inhibit platelet aggregation: omega-3 fatty acids substitute the arachidonic acid that leads to the production of thromboxane A3 which has anti-aggregant and weak vasoconstrictor effects. Omega-3 fatty acids also play an antidyslipidemic effect due to the reduced expression of ApoB100 present in LDL.

2.3.5 Legumes

Often defined as the "meat of poor people", legumes have a dual function for the presence of carbohydrates slowly absorbed and for their high content in proteins. The association of cereals and legumes is complete from the viewpoint of the protein consumption as it provides all the essential amino acids required. Legumes contain discrete quantities of minerals, some vitamins, and dietary fiber, which help to achieve the sense of satiety. They also help to modulate the glycemic response to meals.

2.3.6 Dairy Products and Meat

Milk is an excellent source of proteins, minerals, and vitamins. White meat is to be preferred to red and processed meat that should be consumed in smaller quantity and frequency. Meat is rich in proteins, fats (whose quantity depends on the type and origin of the animal breeding), vitamins, and mineral salts.

2.3.7 Wine

Wine consumption came to scientific attention because of the presence of antioxidant compounds such as resveratrol and quercetin which are able to protect cellular proteins, lipids, and nucleic acids from free radicals. Epidemiological and clinical studies have pointed out that regular and moderate wine consumption during meals (one glass per day for women and two glasses per day for men) reduces the cardiovascular risk and improves lipid profile, hemostatic balance, blood pressure, insulin sensitivity, and HDL cholesterol level [17].

2.4 Adherence to the Mediterranean Diet

Diet quality indexes have been formulated to assess and quantify adherence to dietary patterns (food groups, foods, and/or nutrients) [18]. The most used Mediterranean diet indexes are reported as follows: (a) The Mediterranean Adequacy Index (MAI) was developed by the investigators of the Seven Countries Study and used the

Italian-Mediterranean diet from the Nicotera population in 1960 as reference. The MAI is the quotient between the sum of energy provided by Mediterranean and non-Mediterranean products [19]. The median value of MAI among men aged 40–59 from Nicotera in 1960 was 7.2, whereas in 1996 it decreased to 2.8, thus clearly showing how these Italian groups have changed their diet over the last four decades, gradually abandoning the reference dietary pattern. (b) The Mediterranean Diet Score (MDS) was developed by Trichopoulou et al. and measures the adherence to the Greek-Mediterranean diet [20]. The MDS assigned a score from 0 to 1 according to the daily intake of eight components: high ratio of monounsaturated to saturated fat, moderate alcohol intake, high legume intake, high intake of grains, high fruit intake, high vegetable intake, low intake of meat and meat products, and moderate intake of milk and dairy products. The MDS ranges from 0 (minimal adherence) to 8 (maximum adherence). (c) The MedDietScore was developed by Panagiotakos and assesses the consumption of 11 main components of the Mediterranean diet [21]: non-refined cereals, fruit, vegetables, legumes, potatoes, fish, meat and meat products, poultry, full-fat dairy products, olive oil, and alcohol intake. Each item is scored 0–5 according to rare, frequent, very frequent, weekly, and daily consumption.

Anyway, individual still close to the Mediterranean style are significantly protected. A comprehensive meta-analysis including European and American prospective cohort studies analyzed the relationship between adherence to a Mediterranean diet and mortality and incidence of chronic diseases in a primary prevention setting [22]. Greater adherence to a Mediterranean diet significantly reduced overall mortality (9 %), mortality from cardiovascular diseases (9 %), incidence of cancer or mortality from cancer (6 %), and incidence of Parkinson's disease and Alzheimer's disease (13 %).

Since the Mediterranean dietary pattern improves the global health status by protecting not only against cardiovascular diseases but also against chronic diseases, the World Health Organization strongly supports dietary modification in the direction of a Mediterranean style to prevent chronic diseases [23].

However, evidence from dietary intake surveys [19, 24–29] indicate that the dietary patterns of the so-called Mediterranean diet have changed among the populations bordering the *Mare Nostrum* in the last decades.

Dietary pattern had evolved toward a diet with a high content of saturated fats, high animal proteins, refined grains, and low dietary fiber (the so-called Western diet) [30, 31] due to the lower consumption of home food and high diffusion of ready-cooked food and fast-food restaurants. The caloric intake also increased by 30–40 % (from 2,500 to 3,300 kcal per day), with a progressive depletion of vegetable fats and proteins and complex carbohydrates.

Unhealthy dietary patterns and physical inactivity resulted in a constant and worrying increased prevalence of overweight and obesity that led the World Health Organization to recognize the "obesity epidemic" as a major public health concern worldwide [23]. Nearly 30 % of the world's adult population is obese or overweight, with a significant impact on public health and socioeconomic costs [32]. According to the McKinsey Global Institute report, the global economic impact from obesity is $2.0 trillion, roughly equivalent to the global impact from smoking or armed violence, war, and terrorism [33].

Moreover, the changes in dietary habits with the adoption of sedentary lifestyle are a big concern especially for the younger generations [34]. Overweight and obese children are more likely to become obese adults and to develop nutrition-related diseases, such as type 2 diabetes, cardiovascular diseases, and certain types of cancers [35, 36].

Healthy diet, weight control, and physical activity are the main strategies of the primary prevention against obesity [37].

These recommendations should lead to rediscover and propose daily on our tables the Mediterranean diet because the adequate qualitative and quantitative combination of its typical foods allows to prevent nutritional inadequacies, by excess or by defect, and to provide protection against degenerative and chronic diseases, thanks to their antioxidant and anti-inflammatory properties [38].

The Mediterranean dietary pattern is properly considered the world's healthiest way of eating and living.

2.5 Summary and Conclusions

Healthy diet, weight control, and physical activity are the main strategies of the primary prevention against chronic illnesses.

The Mediterranean dietary pattern, considered the world's healthiest way of eating and living, should be rediscovered and proposed daily on our tables.

The traditional Mediterranean diet – that is, the diet consumed by the people living in the Mediterranean area in the 1950s–1960s after World War II – is not only a way of eating but a body of knowledge, social customs, and cultural traditions historically handed down by populations bordering the *Mare Nostrum*.

The Mediterranean lifestyle includes high intake of whole cereals, legumes, extra virgin olive oil, fruits, and vegetables, moderate to high consumption of fish, moderate consumption of dairy products (mostly as cheese and yogurt), moderate wine consumption, and low consumption of red and processed meats.

The adequate qualitative and quantitative combination of these traditional foods allows to prevent nutritional inadequacies, by excess or by defect, and to provide protection against degenerative and chronic diseases, thanks to their antioxidant and anti-inflammatory properties.

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