CHAPTER 8

Food, nutrition, and health in Greece

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8.1 Introduction

Greece, officially the Hellenic Republic, is situated in the south part of the Balkans and in South East Europe. Being a peninsula itself, it is surrounded by the Aegean, the Ionian, and the East Mediterranean Seas. Greece is largely a mountainous country, with 80% of the land being covered by mountains and hills. Greece also has 6000 islands of different sizes and its coastline measures about 13,000 km, close to the coastline of the entire continent of Africa (18,000 km). All these unique geographical characteristics forced Greeks to become fishermen, sailors, and traders (GNTO, 2020).

As far as the weather conditions are concerned, the country has mild and rainy winters, and hot and dry summers, following the pattern of a typical Mediterranean climate. The main characteristic is the long sunshine duration year-round. The higher the altitude, the harsher the conditions during the winter, so that high on the mountains the climate is alpine-Mediterranean. The unique geography of Greece, the presence of small pieces of farming areas scattered among the mountains, the proximity to the sea, and the large number of islands creates a wide array of climate subtypes (HNMS, 2020), thus allowing the cultivation of a great variety of plants.

8.2 History of dietary habits in Greece

8.2.1 The Neolithic Age

The geographical area currently belonging to Greece was inhabited by hominins as early as 200,000 years ago. Several prehistoric sites dated 6500 BCE were found on mainland Greece. Very recently a prehistoric site was also found on an Aegean island (Carter et al., 2019). The need for reliable and predictable food resources forced people during the Neolithic Age (6000−2900 BCE) to change their lifestyle and shift into the practice of agriculture from gathering plants, hunting, and fishing. As a result, farmers built houses and lived in organized villages by the seventh millennium BCE. People started to cultivate locally domesticated plants (e.g., lentil and grass pea) and imported others, too. The food of the Neolithic people in Greece included a variety

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of plant origin sources, such as cereals, pulses, fruits, and nuts, as well as of animal origin, such as goats, sheep, cows, and pigs. Archaeobotanical research revealed that the preferred wheats where the einkorn (*Triticum monococcum*) and emmer (*Triticum dicoccum*), while pulses included lentils (*Lens* spp.), peas (*Pisum* spp.), bitter vetch (*Vicia ervilia*), and grass pea (*Lathyrus sativus*). The list of the available fruits included wild pistachio (*Pistacia terebinthus*), acorns (*Quercus* spp.), grapes (*Vitis vinifera*), figs (*Ficus carica*), blackberries (*Rubus fruticosus* agg.), and elderberry (*Sambucus* spp.). An interesting fact is the development of processing methods of vegetables and fruits before consumption since some of them are toxic or very bitter to be palatable as such. For example *L. sativus* and *V. ervilia* toxic testa (seed cover) was removed by soaking or boiling the seeds followed by pounding or grinding the moist seeds to split into cotyledons. To summarize, during the Neolithic Age people in Greece were settled down in organized communities and laid the foundations of the later Mediterranean diet, consuming mainly complex carbohydrates, vegetables, fruits, some meat, and wine (Colledge & Conolly, 2007; Perles, 2001; Valamoti, 2012).

8.2.2 The Bronze Age

During the Bronze Age, roughly 3000−1200 BCE, three great civilizations were born in Greece: the Minoan civilization on the island of Crete, the Cycladic civilization in the Cyclades (central Aegean Sea), and the Mycenaean civilization on mainland (Castleden, 1993). Great palaces, houses, and artifacts dating back to the Bronze Age were discovered. The first writing in the Greek world also appeared then allowing inhabitants to register goods and produce stored inside the palaces. During the Bronze Age, imported plant species enriched people's diet. These included spelt wheat (*Triticum spelta*) and millet (*Panicum miliaceum*). Barley (*Hordeum vulgare*) and various wheats were the staple crops and they were ground to produce foodstuffs, such as cracked wheat, bulgur and flour, which were used in soups and flatbreads. Beside cereals, people were cultivating and consuming different kinds of plants, such as vetch (*Vicia sativa*), chickpeas (*Cicer arietinum*), peas (*Pisum sativum*), sesame (*Sesamum indicum*), hemp (*Cannabis sativa*), flax (*Linum usitatissimum*), and castor oil (*Ricinus communis*) plants. Fruits and nuts were an essential part of people's diet. Walnuts (*Juglans regia*), chestnuts (*Castanea sativa*), pistachios (*Pistacia vera*), pomegranates (*Punica granatum*), figs (*F. carica*) (both fresh and dried), grapes (*V. vinifera*), raisins, dates (*Phoenix dactylifera*), almonds (*Prunus dulcis*), cherries (*Prunus avium*), plums (*Prunus domestica*), and wild strawberries (*Fragaria vesca*) were common (Castleden, 2005; Halstead & Barrett, 2016).

Despite the fact that the olive tree (*Olea europaea*) appeared in the archaeobotanical record during the fourth millennium BCE, olive oil production is documented since the second millennium BCE. At that time, olive oil had many applications, apart from its utilization in food preparations, for example as a cleaning material (in the form of soap),

for lighting, and perfume making. Since those years, herbs and spices, such as cumin, fennel, sesame, celery, mint, basil, oregano, rosemary, sage, and thyme were used as condiments. Honey was also produced and it was used as a sweetener in foodstuffs and wine. Cattle, sheep, goats, and pigs were bred for their meat and milk for cheese production, as well as for labor in farming. Public and private feasts were commonly held with various occasions, which enhanced the social relations and solidarity bonds between members of the community. From the wide range of utensils and pots that were found, it is deduced that various methods of cooking, such as boiling, steaming, frying, stewing, baking, and grilling were used by the people of the Bronze Age. However, at the end of this period all three civilizations collapsed for reasons still unidentified by archaeologists (Fischer, 2017; Nitsch, Jones, Sarpaki, Hald, & Bogaard, 2019).

8.2.3 The Dark Ages (of Greece), the Archaic and the Classical periods

The period that followed the destruction of the three civilizations is known as the "the Dark Ages of Greece" (roughly 1200–800 BCE) because very little is known about it. Even the written language was lost. The period after the Dark Ages until the end of the Persian Wars (479 BCE) is named the Archaic. This period precedes the Classical period that ends with the death of Alexander the Great (323 BCE). During both periods, the cuisine is characterized by its frugality. Even though a wide variety of edible vegetables and fruits were known and used, agriculture in Greek's mostly mountainous area was a difficult process. Food was barely sufficient to sustain life and this could be one of the reasons that Greeks left to colonize many areas around the Mediterranean Sea (e.g., South Italy, France, Spain, and Asia Minor) and the Black Sea (Ancient History Encyclopedia, n.d.). The cuisine was based on cereals, olives, grapes, and legumes, which are the foundations of the Mediterranean diet. Only some vegetable and fruit varieties were available, while fresh fish was expensive apart from small fresh fish and salty fish that were affordable. Later, when people learned how to deep sea fish and how to preserve fresh fish, fish eating became more popular. Athenians were very fond of eels, as described by Aristophanes (Bierl, Christopoulos, & Papachrysostomou, 2017). The staple food was unleavened bread, while raised bread was considered a luxury. Often a meal would comprise only bread, while other times accompaniments, such as table olives, were consumed. It is very important to mention that many of the habits that are common practice today have originated from that time. This will be discussed later in the chapter. Preservation methods included fermentation and several foodstuffs were produced, such as vinegar, cheese, and wine. Olive oil was used for cooking, preserving, as well as a dressing for vegetables and in marinades. Pulses were usually dried for long-term storage and then used after soaking in water, a practice still in use today. Pulses were also consumed fresh. Roasted pulses, such as chickpeas, were used as accompaniment to wine, similar to today. However,

meat was scarce and it was consumed mainly during religious festivals organized by the city. The sacrificed animal was shared to the attendants and only the inedible parts were dedicated to Gods. There is also evidence that the supporters of Orphicism and Pythagoreanism, two common ancient Greek sects, followed a vegetarian diet (Wilkins & Nadeau, 2015).

During the Classical period (497–323 BCE) ancient Greeks realized that plants and animals taste differently in different microclimates. This realization increased their gastronomic consciousness and as a result, some areas of ancient Greece became famous for their products, a kind of today's Protected Geographical Indication (PGI) products. The cookbooks that appeared during this period were written not by cooks, but by poets passing on intellectual knowledge. All Greek cities were competing for their local produce and cuisine—the wines of Mende, Chios, Lesbos, Thasos, and Corinth were very popular. Also, the amphorae containing exceptional quality products were bearing stamped trademarks (Dalby, 1996; Takeshi, 2009).

After the 7th century BCE, "symposiums," meaning in Greek "to drink together," became the hallmark of the Athenian's social life. It was customary for a group of men to have dinner together and afterwards to drink wine with accompaniments, while they were entertained or discussed on a topic. Even though during the Bronze Age women participated in the banquets, in Classical Greece women were excluded from public sacrifices and symposiums. Another defining characteristic of the Ancient Greeks is that they believed illnesses are caused by imbalances in the body and that food choices affect the health of the individual. This is presented profoundly in the work of Hippocrates (460–377 BCE), considered the father of medicine. He believed that diet is the most important intervention to fight disease. "Diet" in Ancient Greek meant "way of living—lifestyle" and included not only food choices, but also different activities, such as exercise, sexual activity, hygiene, and sleep. Hippocrates, for example, advocated walking, especially after a meal (Cardenas, 2013; Irby, 2016).

8.2.4 The Hellenistic and the Roman eras

The following two large periods are the Hellenistic era (from the death of Alexander the Great in 323 BCE to the Roman conquest of Greece in 146 BCE) and the Roman era (146 BCE–CE 330). The rise of Macedonia and the conquests of Alexander the Great brought great and lasting changes in the variety of foods and in gastronomy of Greece. Alongside imported spices, such as pepper and cinnamon, new citrus fruits appeared, such as lemon, apricots, and jujube, while rice became known, but not common. Macedonians liked to eat more meat, which was traditionally obtained by hunting, and introduced the use of flat bread as a plate for serving meat, which later became the pita of Greece and the pizza of Italy. Rome later conquered Greece, but as Horace said "Greek culture conquered Rome," since the Greek medicine and gastronomy were also

adopted by the Roman world. Later, the famous Greek doctor Galen (2nd century CE) adopted and enriched Hippocrates' theories about medicine declaring dietetics as a branch of medicine. Galen distinguished food that nourishes from drugs that produce changes in the body (Galen, 2003; Grant, 2000).

In terms of gastronomy, cooking was considered an art and cooks were considered equal to poets, as poets produced food for the mind while cooks for the belly. The symposiums evolved to banquets where different people (e.g., men, women, and children) from different classes were gathering to drink wine after the meal and to have discussions on politics, society, and culture. These social gatherings reinforced friendships and created political and financial alliances pinpointing the importance of gastronomy as social intervention. It is very probable that ancient Romans did not cook, but purchased all their food from the numerous taverna places where agricultural and industrial products, as well as cooked food and wine, were sold (Crook, Lintott, & Rawson, 1994).

8.2.5 The Byzantine or Eastern Roman Empire

The Byzantine Empire (also known as the Eastern Roman Empire) is the longest-lived empire in history (1000 years) only second to the Empire of Japan. Its history starts with the moving of the capital of the Roman Empire to Constantinople (i.e., today's Istanbul), in CE 330. The fall of Constantinople to Ottoman Turks in 1453 marked the end of the empire.

The hallmark of this period is the prevalence of Christianity that had, among others, an impact on food and nutrition. The Christian Orthodox Church has set guidelines for the periodic abstinence from specific foods in order to strengthen the willpower and to discipline those who fasted, with the ultimate goal to be closer to God. The voluntarily fasting period in the Christian Orthodox Church lasts for 180–200 days spread over a year. Basically it is a vegetarian diet, which includes avoidance of meat (except mollusks, crustaceans, and fish eggs), milk, dairy products, and eggs. At specific times, such as most Wednesdays and Fridays, plant oils and wine are also prohibited. The few studies on the influence of the Christian Orthodox Church religiosity and fasting on human health have found that in general fasting is associated with lower body mass index, lower waist circumference, lower obesity levels, and better lipid profile, while it increases the percentage of total carbohydrates, fiber, folate, and iron (Chliaoutakis et al., 2002; Lazarou & Matalas, 2010; Sarri, Tzanakis, Linardakis, Mamalakis, & Kafatos, 2003).

8.2.6 Modern times

After the devastating Second World War that has left a smaller population and destroyed the infrastructure, Greeks had to work hard and sustain life through a frugal diet. During the 1950s and 1960s, the research of Dr. Keys described the Mediterranean diet

(MD) in his famous "Seven Countries Study" and showed that this frugal diet was one of the healthiest in the world (Keys, 1980). In his study, he described the eating habits of people living around the Mediterranean Sea and mainly in Crete, an island of Greece, the rest of Greece, and South Italy. The MD (Fig. 8.1) is based on high consumption of unrefined grains, vegetables, fruits, legumes, and olive oil, a moderate consumption of dairy products, fish, and wine, and a low consumption of red meat, processed meat, refined sugars, and ultra-processed foodstuffs (Willett et al., 1995). The MD has been linked to a large number of health benefits, including reduced mortality

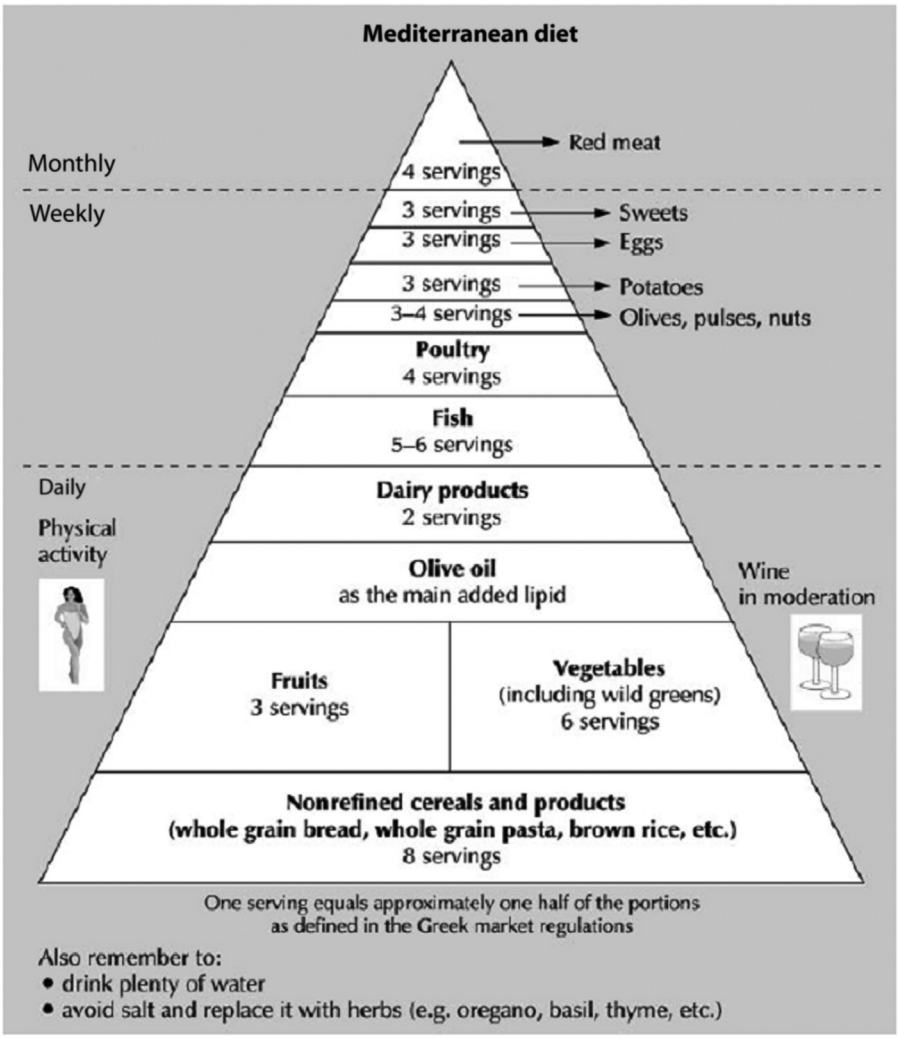

Figure 8.1 The pyramid of the Mediterranean diet (Ministry of Health and Welfare, 1999).

risk and the prevention of many noncommunicable diseases, such as cardiovascular diseases, diabetes, metabolic syndrome, and various types of cancer (Romagnolo & Selmin, 2017). The MD was found also to ameliorate respiratory diseases, bone diseases, such as osteoarthritis, and others. In general, it improves the quality of life and promotes healthy aging (Serra-Majem et al., 2019). Adherence to the MD protects from age-related cognitive decline, dementia, including Alzheimer's disease (Shannon et al., 2019), while it also protects against depression and even improves mood (McMillan, Owen, Kras, & Scholey, 2011). Omega-3 fatty acids, probiotics, fiber, polyphenols, and exercise are some of the key factors that protect from depression and assist to successful aging (Dinan et al., 2019; Spencer, Korosi, Layé, Shukitt-Hale, & Barrientos, 2017), while it has been shown that higher amounts of saturated fatty acids and sugars (limited in MD) are associated with higher anxiety in older adults (Masana et al., 2019).

The difference in health outcomes in the Mediterranean countries versus other countries are not limited to different dietary habits, but can also be attributed to different lifestyles. In 2010 the United Nations Educational, Scientific, and Cultural Organization (UNESCO) recognized the MD as an Intangible Cultural Heritage and has emphasized its social characteristics, including its practices and traditions related to food processing, preparation, preservation, and consumption (UNESCO, n.d.). Family, friends, and networks play an important role in Greece. Mediterranean families used mealtimes as a way to bond and connect across generations (Iglesias-López, 2019). Close relationships and sociability affect the health status of human beings, reducing by 50% the risk of early death (Holt-Lunstad, Robles, & Sbarra, 2017).

Geography, climate, history, traditions, religion, economy, social factors, hardship, and poverty shaped the "traditional" MD in Greece. Common practices in the Greek MD include: home cooked meals, eating main meals in company, fasting, following traditions, using simple methods for preservation. Physical activity, mainly walking, is an important factor of the MD, as well as napping after lunch (Kallistratos et al., 2015; Naska, Oikonomou, Trichopoulou, Psaltopoulou, & Trichopoulos, 2007). Additionally, the climate allows people to be outside for long periods and to synthesize vitamin D that is considered to be a hormone because it modulates gene expression and consequently affects many cell functions (Pilz et al., 2019). Moreover, ultraviolet B (UVB) light affects positively the human microbiota (Bosman, Albert, Lui, Dutz, & Vallance, 2019).

Popular small dishes, called "mezze," accompany the main dish and, sometimes, the meal includes only several types of "mezze." The vegetarian dishes are usually accompanied by a side dish of animal origin, such as feta cheese, yogurt, salty fish, or even fish eggs, which complement and increase the nutritional value and the bioavailability of different nutrients. Salads accompany the main meals; wild greens, such as purslane, amaranth, sow thistle, nettle, etc. are also used, generally as a filling for pies, salads and stews (Trichopoulou, 2007). Fruits, apart from being consumed fresh, are

processed and used as desserts and sweets; spoon desserts like preserved fruits, vegetables, and nuts in sugar syrup are commonly offered to guests as an occasional treat. Typical beverages, consumed in moderate amounts, are herbal teas, such as mountain tea, chamomile, and Greek coffee (Radd-Vagenas, Kouris-Blazos, Singh, & Flood, 2017). Last but not least, seasonality also plays a role in Greeks' food choices. Specific dishes are eaten when products are in abundance and have the highest nutritive value; examples are eggplant dishes especially consumed in the summer, while dishes with cabbage and leeks are typical for winter.

8.3 Basic components of the Mediterranean diet

8.3.1 Olive oil

Olive oil is considered one of the most important nutritional components responsible for the health benefits of the MD (Martinez-Gonzalez & Martin-Calvo, 2016). Olive oil is mainly composed of triacylglycerols (98%–99%), but unlike in other plant based oils the monounsaturated fatty acids (MUFAs; 70%–80% oleic acid) predominate. The unsaponifiable fraction has over 200 minor components, including α- and γ-tocopherols, tocotrienols, β-carotene, phytosterols, flavonoids, and hydrophilic phenolic compounds of great nutritional importance (e.g., oleuropein, hydroxytyrosol, tyrosol, and oleocanthal) (Fernandes et al., 2020). Particular attention has been paid to the phenolic compounds, largely due to their antioxidant effect, but also to its antiinflammatory activity (Jain, Buttar, Chintameneni, & Kaur, 2018). Their presence is so important that in 2012 the European Food Safety Authority (EFSA) published a health claim related to polyphenols in olive oil stating that "Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress. The claim may be used only for olive oil, containing at least 5 mg of hydroxytyrosol and its derivatives (e.g. oleuropein complex and tyrosol) per 20 g of olive oil. In order to bear the claim information shall be given to the consumer that the beneficial effect is obtained with a daily intake of 20 g of olive oil" (Turck et al., 2018). Although there is scarce knowledge on the differences between Extra Virgin Olive Oil (EVOO) and refined olive oils, it can be assumed that the multiple health benefits attributed to the bioactive ingredients that are in abundance in EVOO might be lost in refined oils (Mazzocchi, Leone, Agostoni, & Pali-Schöll, 2019).

Although in the last years olive oil consumption per capita has declined from 20 kg in 1990 to 16 kg in 2014, Greece still has the highest levels of olive oil consumption. At the same time the consumption in Spain and Italy was approximately 11 kg per capita (National Bank of Greece, 2015). In Greece olive oil is used for all food preparations ranging from raw consumption all the way to frying. Despite the misconception that olive oil is not suitable for frying, studies have highlighted the stability of olive oil against oxidation during this severe process (Abenoza, De Las Heras, Benito, Oria, & Sánchez-Gimeno, 2016;

Andrikopoulos, Kalogeropoulos, Falirea, & Barbagianni, 2002). This stability has been attributed to the high percentage of MUFAs, as well as to the well balanced pool of bioactive microconstituents that have high antioxidant activity.

The presence of olive oil in traditional dishes is highlighted by the use of the term "ladera," coming from the word "ladi" that means olive oil in Greek. This term is used for vegetable dishes that are cooked in a large amount of olive oil combined with various herbs and tomatoes. These classical dishes have developed from a simple cooking style and include many summer dishes based on fresh seasonal produce. Many of these dishes are eaten during the fasting period since animal origin products are forbidden from the diet. The frequent consumption of "ladera" allows Greeks to consume large amount of vegetables effortlessly, thus easily reaching the recommended five servings per day (Trichopoulou & Vasilopoulou, 2015). Recent findings highlight the use of EVOO in all food preparations, since its use can increase the bioaccessibility and bioavailability of various bioactive compounds (Rinaldi de Alvarenga et al., 2019).

8.3.2 Table olives

Table olives are the products prepared from sound fruits of the cultivated olive tree (*O. europaea* L.). They have been a component of the MD for centuries, while their consumption is increasing due to their nutritional and palatable characteristics. Numerous studies have demonstrated their various health benefits, such as the prevention of coronary heart disease, some cancer types, and inflammation. This is due to the fact that they contain several nutritional components. However their amount largely depends on the olive variety, the maturation stage of the olive fruit, the cultivating conditions, and the processing method (Kailis & Harris, 2007).

Several phenolic compounds have been identified in table olives, including oleuropein, hydroxytyrosol, tyrosol, rutin, quercetin, as well as caffeic, vanillic, and r- and q-coumaric acids. However, the composition of phenols in olives is highly variable, both in quality and quantity, as it is dependent on several factors, such as the irrigation regimes, the cultivar, and the degree of drupe maturation and most importantly, the processing method (Malheiro, Sousa, Casal, Bento, & Pereira, 2011). In a recent study, nine commercial types of Greek olives were examined for their hydroxytyrosol and oleurepein content. Hydroxytyrosol was found in all samples and the highest levels were determined for Kalamata olives and green "tsakistes" (Zoidou et al., 2010). Moreover, according to the results of a study performed on five different varieties of Greek table olives it has been claimed that the consumption of 5–10 table olives per day might cover the daily intake of phenols (Boskou et al., 2006).

Triterpenoids are a group of secondary metabolites derived from the cyclization of squalene, oxidosqualene or bis-oxidosqualene and they are considered as highly functional food components (Xu, Fazio, & Matsuda, 2004). They are found in a variety of

plant tissues and in the case of olives they represent 90%–95% of the cuticle lipids. Among all, the ones most commonly found in olive fruit are maslinic and oleanolic acids and are located in the epicarp of the fruit (Alexandraki et al., 2014). Maslinic acid is arising as a novel natural molecule that exerts a wide range of biological activities and it has been detected in high levels in Kalamon olives (1318 mg/kg dry weight) (Romero et al., 2010). With regard to the effect of processing, it was found that untreated Kalamata olives have higher levels of triterpenic acids than olives treated with alkali to adjust their color. Additionally, it has been shown that fast debittering with NaOH of Spanish-style olives has a profound negative effect on the concentration of triterpenic acids (Alexandraki et al., 2014).

Table olives can be an excellent source of probiotics. Probiotics have been shown to have antipathogenic, antidiabetes, antiobesity, antiinflammatory, anticancer, and antiallergic properties. They also affect brain function and central nervous system through the gut-brain axis. Recently, 71 strains isolated from Greek fermented olives were evaluated in vitro for their probiotic activity and it was found that in total nine lactic acid bacteria strains possessed desirable in vitro probiotic properties similar or even better compared to reference probiotic strains (Argyri et al., 2013). Moreover, the potential technological and the probiotic features of 12 yeast strains isolated from Greek natural black table olive fermentations have been evaluated with very promising findings (Bonatsou, Benítez, Rodríguez-Gómez, Panagou, & Arroyo-López, 2015).

8.3.3 *Chórta* and pies

Greece has one of the highest plant biodiversity in Europe due to the dramatic geological history, the fact that the area remained unglaciated in the last glacial period, the variety of landforms, and the remarkable range of microclimates. Of the 5800 plant species present, about 900 species are endemic, while the large proportion of neoendemics indicates active speciation processes (Georgiou & Delipetrou, 2010; Pullaiah, 2019). In Greece, and especially in Crete, the inhabitants have developed an outstanding tradition in identifying and collecting wild greens, which are used in a variety of dishes, incorporated into their daily diet, or consumed raw in the form of salads. Consequently, wild and semidomesticated greens (i.e., *chórta* in Greek) form an integral part of the Greek dietary regime; their consumption and medicinal qualities are referenced in ancient texts. Certain edible greens possess a particularly high phenolic content and exhibit a strong antioxidant activity; they are also a valuable nutritional source, being rich in fiber, vitamins, and minerals such as iron and zinc (Mikropoulou et al., 2018).

In an attempt to evaluate the nutritional value of these products, the flavonoid content of samples of Greek edible wild greens, such as fennel, chive, hartwort, and others was assessed. It was found that those wild greens have a very high flavonoid

content when compared with regular fresh vegetables, fruits, and beverages commonly consumed in Europe and the most predominant compound in the examined wild greens was quercetin, followed by kaempferol (Trichopoulou et al., 2000). These greens are the base of a traditional dish, the green pie, which based on research can be characterized as the flavonoid rich Greek snack. In most cases a mix of greens is used as a filling for the preparation of the pies, thus enhancing their nutritional value (Vasilopoulou & Trichopoulou, 2009). In a recent study, the chemical profile of the decoction of eight endemic edible plants was examined. The investigated decoctions—among which *Centaurea raphanina*—were found to be rich in pinocembrin analogues and were correlated with cytotoxic and antioxidant properties (Mikropoulou et al., 2018).

8.3.4 Legumes, cereals, and pulses

Since ancient times, unrefined cereals were used for the production of bread which is the stable food in Greece. A high consumption of whole grains is associated with healthy aging (Foscolou et al., 2019). Typical legumes of the Mediterranean region and of Greece are lentils, chickpeas, and beans. They are usually consumed mixed with cereals, vegetables, meats, and fish and constitute a pillar of local cuisine (Serra-Majem et al., 2019). In Greece, a traditional type of bread is prepared with fermented chickpea seeds that act as a leavening agent. It is called "chickpea bread" in Western Macedonia and Northern Greece, but it is commonly known all over Greece as "eftazymo." It is a rather interesting product since the addition of fermented chickpea in the wheat flour, besides increasing nutritional quality, enhances shelf life as well (Hatzikamari, Kyriakidis, Tzanetakis, Biliaderis, & Litopoulou-Tzanetaki, 2007).

Consumption of legumes has been linked with a decreased risk of suffering various chronic diseases including colorectal cancer (CRC) that is globally the second most common type of cancer both in men and women. There are two important groups of substances present in legumes, namely fiber and protein. Their mechanisms of action to prevent CRC or inflammation are probably mediated by the intestinal microbiota composition (Aranda-Olmedo & Rubio, 2020).

8.3.5 Fruits and vegetables

A high consumption of vegetables and fruits provide not only macro- and micronutrients, but also fiber and phytochemicals. The high fiber content of the MD contributes to long-lasting feeling of satiety and as a result to a lower energy intake and better weight control (Diekmann et al., 2019). Furthermore, the fibers consumed in high amounts act as prebiotics increasing the number of the beneficial probiotics found in the gastrointestinal tract (Aune et al., 2017; Reynolds et al., 2019; Yang et al., 2019). Studies have shown that the MD can be considered as the best solution for optimal

microbiota diversity and stability (Rinninella et al., 2019). It is well documented that phytochemicals play an important role in human health and that polyphenols can protect from cancer metastasis, among others (Weng & Yen, 2012; Yen, Tsai, Lu, & Weng, 2018). Recently, it was demonstrated that compounds, such as resveratrol in grapes and wine, quercetin in apples, as well as physical activity act epigenetically on human genes preventing transcription of the aging-related genes (Chatzianagnostou, Del Turco, Pingitore, Sabatino, & Vassalle, 2015). Additionally, hydroxytyrosol one of the major polyphenols in EVOO has been found also to act epigenetically under inflammation conditions ameliorating threats to health (Scoditti et al., 2019). It is important to mention that a large number of markers identified using metabolomic techniques have been associated with the consumption of fruits and vegetables. For example, urine concentrations of *S*-methyl-L-cysteine sulfoxide were found to be related to the intake of cruciferous vegetables in a short-term intervention study that included 20 healthy men who consumed 250 g/day of cruciferous vegetables (broccoli and Brussels sprouts) for 14 days (Edmands et al., 2011).

8.3.6 Protected traditional products

A great number of traditional Greek products possess unique sensorial characteristics that can act as a marketing tool and enhance exports. Consequently, many efforts have been made in order to register these products at the European Union level as PGI or Protected Designation of Origin (PDO). Table 8.1 presents the products that have been registered up to now, but additional efforts should be made for the increase of this number. In this list various well-known products, such as feta cheese, the Greek red Saffron named Krokos Kozanis, and the Chios Mastiha resin are included.

Table 8.1 Number of Greek products with PGI or PDO certification (eAmbrosia Database, n.d.).

Category	PGI	PDO
Olive oil	12	19
Table olives	1	10
Cheese	1	22
Fruit- vegetable- nuts and pulses	17	17
Bakery and confectionery products	2	0
Fresh fish, mollusks, crustaceans, and derived products	0	1
Fresh meat	0	2
Other products of animal origin	0	2
Natural gums and resins	0	2
Essential oils	0	1
Other products	0	1

8.4 Mediterranean diet and sustainability

Due to the increased environmental concerns of consumers, additional focus has been given lately to the sustainability aspect of certain diets apart from their nutritional value.

Sustainable diets are those diets with low environmental impacts, which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (Burlingame & Dernini, 2010).

In this context, the MD fulfills all the requirements in order to belong to the group of sustainable diets. It is widely accepted that plant-based diets have a smaller water footprint and lower greenhouse gas emissions, compared with industrialized diet and, since the MD uses low amount of meat, it is considered sustainable. Moreover, a wide variety of plants, not only the cultivated ones, but also wild greens are consumed since people have acquired the knowledge of how to use and sustain them, thus increasing local biodiversity and the nutritional value of the MD (Trichopoulou, Vasilopoulou, Georga, Soukara, & Dilis, 2006). Therefore, sustainability can be achieved by the "use of more forks and less knives" (Berry, 2019).

As far as agriculture and sustainability are concerned, the general agronomic, environmental, and economic benefits from legume cultivation have been studied extensively. Consequently, a legume-rich diet would have benefits not only for humans and livestock, but for the environment as well (Reckling, Bergkvist, Watson, Stoddard, & Bachinger, 2020). Moreover, it was recently demonstrated in a study conducted by the International Olive Council that for every liter of olive oil produced, 10.65 kg of CO_2 is extracted from the atmosphere, and that global production of olive oil could even absorb the equivalent CO_2 emissions of a city with a population of over 7 million, or the size of Hong Kong (International Olive Council, n.d.).

In summary, the seasonal consumption of local products, the biodiversity, the minimal food preservation-processing techniques, the methods of cooking, moderation in portion sizes, and the small amount of waste due to frugality are some of the hallmarks of MD. The production of many fresh and/or specialized products produced in specific environments by small and medium enterprises contribute to the sustainability of the rural areas (Vasilopoulou, Dilis, & Trichopoulou, 2013). After all, as the "mother of the Mediterranean diet," Antonia Trichopoulou, declares: "Traditional diets are compatible with the respective ecosystem and are, more often than not, supportive of the local economy" (Oldways Cultural Food Traditions, n.d.).

8.5 Future outlook

Despite the well-documented health benefits of the MD, recent studies show that Greek children and adolescents show low adherence rates to the MD

(Kontogianni et al., 2008). The knowledge and the family income seem to be of great importance in this behavior especially in the years of the economic crisis (Tsartsali, Thompson, & Jago, 2009). In that respect, the education of individuals from the very early steps of their lives is required.

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