Extra virgin olive oil (EVOO) is traditionally used in Mediterranean countries, not only for oil dressing (raw use) but widely for food cooking and frying. Phenolic antioxidants and flavour compounds in EVOO show many molecular interactions with other ingredients during cooking for traditional Mediterranean food preparations. The use of raw EVOO added to foods after cooking (or mixed without cooking, or as a salad oil) is the best way to express the original flavour and to maximize the intake of natural antioxidants and compounds related to positive effects on human health (e.g., hypotensive, anti-inflammatory and anti-carcinogenic activities), but a protective action is also exhibited by EVOO components during cooking. The biophenols and flavours, in particular, also interact (through hydrolysis, oil/water (O/W) partitioning, complex formation, covalent and non-covalent binding) with other ingredients (tomato, meat, fish, potato, vegetables and milk proteins) with a functional role in cooked foods.

**What Is EVOO?**

Extra virgin olive oil (EVOO) is obtained from olive fruits exclusively by physical-mechanical technologies (olive crushing, centrifugation, filtration, etc.), thus ensuring that this ‘lipid fruit juice’ has a particular composition, olive triacylglycerols becoming a ‘solvent’ for several natural fruit components (antioxidants, flavour, pigments, etc.) responsible for its sensory and nutritional quality (Sacchi, 2008) (Figure 44.1).

In the last few years, several papers have correlated the in vitro and in vivo positive actions of EVOO on human health to its chemical composition (Preedy and Watson 2010; Frankel 2011). Health properties of EVOO were attributed to both the high level of oleic acid in triacylglycerols and to many different minor compounds (squalene, tocopherols, pigments and volatile compounds) and, in particular, to phenolic compounds such as phenyl alcohols, secoiridoids and lignans (Figure 44.2) present in the unsaponifiable fraction of EVOO (Frankel, 2011).

Antimicrobial, antioxidant and anti-inflammatory activities were significantly associated with EVOO (Cicerale et al., 2012).

As regards anti-inflammatory benefits of EVOO, particular attention was paid to the phenolic compound named oleocanthal (Lucas et al., 2011). This was demonstrated to have ibuprofen-like activity, as both compounds inhibit the same cyclooxygenase enzymes in the prostaglandin-biosynthesis pathway (Bechaump et al., 2005). However, a scientific demonstration that oleocanthal, in the amount contained in EVOO, can be the only compound responsible for EVOO’s anti-inflammatory effect is still lacking (Fogliano and Sacchi, 2006). In fact, mounting evidence in food science and health research indicates that it is the complex mixture of polyphenols in foods, rather than individual compounds, that can synergistically act towards a final health effect. In the case of EVOO, this concept has been demonstrated for pinocresinol and colon cancer (Fini et al., 2008). Those authors reported that pinocresinol-rich EVOO extracts have potent chemo-preventive properties in colon cancer cells and that this result was achieved at substantially lower concentrations in EVOO than with purified pinocresinol (Fini et al., 2008).

The European Food Safety Authority (EFSA) Panel on Dietetic Products, Nutrition and Allergies (NDA) in 2011 provided a scientific opinion on the scientific substantiation of health claims in relation to polyphenols in olive and protection of low-density lipoprotein (LDL) particles from oxidative damage, maintenance
of normal blood high-density lipoprotein (HDL)-cholesterol concentrations, and maintenance of normal blood pressure: ‘anti-inflammatory properties’, ‘contributes to the upper respiratory tract health’, ‘can help to maintain a normal function of gastrointestinal tract’ and ‘contributes to body defences against external agents’.

The food constituent that is the subject of the health claims is polyphenols in olive (olive fruit, olive mill waste waters or olive oil, and Olea europaea L. extract and leaf). On the basis of the data presented, the Panel concludes that a cause and effect relationship has been established between the consumption of olive oil polyphenols (standardized by the content of hydroxytyrosol and its derivatives) and protection of LDL particles from oxidative damage. The Panel considers that in order to support the claim, 5 mg of hydroxytyrosol and its derivatives (e.g., oleuropein complex and tyrosol) in olive oil should be consumed daily (EFSA, 2011).

Along with chemical stability towards oxidation processes (high oxidation stability) due to antioxidant capacity, phenolic compounds in EVOO also contribute to its bitter and pungent taste, influencing its acceptability (Cavallo et al., 2019). The phenol compounds and the natural volatile compounds with the ‘olive fruity’ aroma make of EVOO, at the same time, a ‘functional food’ and a ‘food flavour’ (Sacchi, 2008).

The large variation in chemical and sensory quality found on the market among EVOOs, as well as in price, indicates for those products also a wide range of nutritional properties. In particular, food chemists and panels of experts agree on the fact that more bitter EVOOs have a higher quality, and thus, EVOO taste may be a good driver for consumers to make a choice towards products having healthy characteristics (Vitaglione et al., 2015).

Changes in phenolic and volatile compounds also arise during cooking of EVOO, as well as many interactions with other ingredients used in Mediterranean food preparations. The culinary aspects of EVOO, however, have been analysed in only a few papers and already reviewed (Sacchi et al., 2014).

The aim of this chapter is to give a brief overview of the interactions of EVOO in Mediterranean foods and to underline some basic molecular keys to explain the ‘magic’ of EVOO and its role in Mediterranean gastronomy.

### EVOO in ‘Mediterranean Molecular Cuisine’

The use of raw EVOO added to foods after cooking (or as a salad oil) is the best way to express the original flavour and to maximize the intake of natural antioxidants and EVOO compounds associated with positive effects on human health (e.g., hypotensive, anti-inflammatory and anti-carcinogenic).

EVOO, however, also exhibits its protective properties when it is used in cooking. Chemical interactions between EVOO biophenolic compounds and other food ingredients (water, milk proteins, carotenoids of tomato, omega-3 polyunsaturated fatty acids in canned-in-oil fish, meat or fish proteins, etc.) have been investigated. During cooking, EVOO exhibits strong antioxidant properties and influences the overall flavour of cooked foods. The physical (partitioning, emulsion) and chemical (hydrolysis, covalent binding, antioxidant properties) phenomena occurring when EVOO is cooked with other food ingredients also involve changes in sensory (bitterness and fruity) and nutritional quality of some traditional Mediterranean foods.

Molecular interactions also occur during cooking between EVOO bitter phenolic compounds and other compounds in different cooked food systems, thus increasing the healthy properties of cooked foods. These will be discussed in the following sections.

### EVOO in Fish Canning and Cooking

The interactions between EVOO used as filling oil and canned tuna muscle allows the preservation of the intake of native n-3 polyunsaturated fatty acids (PUFAs) present in fresh fish muscle before tuna canning. The level of n-3 PUFAs, measured by proton nuclear magnetic resonance (NMR) spectroscopy after tuna can sterilization, was significantly higher in tuna canned in EVOO compared with tuna muscle canned and sterilized in soybean or refined olive oil, or in brine (Medina et al., 1995; Medina et al., 1998a). The level of oxidation found in lipids extracted from canned tuna muscle was also lower when canned in EVOO. The protective effect of EVOO during/after the thermal treatment of
the cans can be attributed to the properties of natural antioxidants of EVOO, which are not present in other filling oils or brine (Medina et al., 1998b; Fogliano et al., 1999). In particular, by monitoring the level of phenol compounds in filling oils before and after the sterilization of the cans, a strong partitioning from the oil phase towards the water phase (muscle) was observed after the thermal treatment, combined with the hydrolysis of secoiridoid aglycones (Sacchi et al., 2002; Brenes et al., 2002) (Figure 44.3).

The combination of these two phenomena (partitioning and hydrolysis) leads to the accumulation of hydrophilic phenolic antioxidants (hydroxytyrosol and tyrosol) on the muscle surface, protecting the n-3 PUFA from thermal oxidation.

**Tomato–EVOO Interactions**

Fresh tomato and tomato products are characterized by healthy value and anti-carcinogenic activity, especially towards prostate cancer (Pannellini et al., 2010). The intake of carotenoids (lycopene) has been related to anti-carcinogenic activity and anti-atherogenic effects both in vitro and in vivo (Omoni and Aluko, 2005).

In the human diet, both fresh and transformed tomatoes are consumed around the world, but typical (Italian) Mediterranean gastronomy is characterized by a high use of tomato and olive oil in combination with pasta, pizza, etc.

In recent years, we studied the behaviour of different model systems simulating the cooking of tomato sauces in combination with EVOO. In particular, some traditional tomato sauce preparation (i.e., the Neapolitan Ragù) requires long cooking (6–10 hours) at medium-low temperatures (70–80 °C) in traditional earthenware pots (Figure 44.4). What happens when a tomato–oil system is heated under these mild conditions? A loss in the antioxidant content can be expected at the end of cooking, and this has been verified in tomato sauce submitted to a heating test (Pernice et al., 2007). Surprisingly, a significant increase in the antioxidant properties of both water and oil phases during cooking of tomato sauce with EVOO was observed (Figure 44.5), with a protective action exhibited by phenolic compounds of EVOO on tomato carotenoids. The chemical/physical behaviour of secoiridoid aglycones present as main compounds in EVOO...
when added to tomato sauce is characterized by partitioning towards the acid-water phase of tomato juice, and hydrolysis of secoridoids in elenolic acid and phenyl alcohols (tyrosol and hydroxytyrosol), similarly to other heated food systems, as described earlier for tuna canning and sterilization (Figure 44.3). These compounds, by partitioning towards the tomato phase and ester bond hydrolysis, lost their bitter-pungent properties and exhibited, at the same time, their antioxidant action in the water phase (Pernice et al., 2007).

On the other hand, the partitioning of carotenoids towards the oil phase was also observed during cooking of tomato/EVOO mixtures (Figure 44.6) as well as that of some tomato flavonoids (naringenin) (Sacchi et al., unpublished data). These molecular phenomena can also explain the antioxidant efficiency, carotenoid bioavailability and in vivo effects of food preparations in which EVOO is used (Lee et al., 2000).

Arranz et al. (2015) also evaluated the effect of adding olive oil to tomato juice (not treated with heat) on the bioavailability of plasma carotenoids and postprandial lipid response. In a randomized, controlled, crossover feeding trial, volunteers were assigned to receive a single ingestion of 750 g of tomato juice (TJ) containing 10% of refined olive oil/70 kg body weight (BW) and 750 g of TJ without oil/70 kg BW on two different days. Levels of all lycopene isomers increased significantly in subjects consuming TJ with oil, reaching a maximum concentration at 24 h. LDL-cholesterol and total cholesterol levels decreased significantly 6 h after the consumption of TJ with oil, which was significantly correlated with an increase of trans-lycopene and 5-cis-lycopene, respectively. Thus, the positive effect on bioavailability and absorption of carotenoids of olive oil is expressed also without cooking and can be considered in evaluating the nutritional properties of the classical Mediterranean tomato salads or fresh combinations of tomato juice like Gazpacho ‘funionalized’ by the addition of EVOO.

Valverdú-Queralt et al. (2014) studied the effect of cooking time (15, 30, 45 and 60 min) and the addition of extra virgin olive oil (5% and 10%) on the phenolic content of tomato sauces by using liquid chromatography coupled with tandem mass spectrometry (LC-MS). The concentration of phenolics in the tomato sauces decreased during the cooking process, with the exception of caffeic acid and tyrosol. The main degradation observed was the oxidation of quercetin, since the hydroxy-function at the C-ring of this flavonoid is not blocked by a sugar moiety, unlike rutin. Higher levels of virgin olive oil in tomato sauce enhance the extraction of phenolic compounds from the tomato, leading to higher phenolic contents in the sauces. These data are in accordance with the trend shown in Figure 44.5 for antioxidant activity, which increased in the tomato phase after 2 hours, but showed a slight decrease up to 8 hours. Another phenomenon to be considered in these systems is Maillard reactions with the newly formed melanoidins, which contribute to increased antioxidant power of cooked foods (Pernice et al., 2007).

All these observations and data can be of interest in relation to the day-by-day preventive action of some ‘traditional functional foods’ such as Neapolitan pizza, pasta with tomato sauces (like the traditional Neapolitan Ragù), ‘gazpacho’, ‘bruschetta’ and other dishes in which EVOO and tomato are cooked or mixed together. These traditional preparations can be considered to be very healthy, as they allow very efficient absorption of functional biomolecules (phenols, carotenoids and flavonoids) having antioxidant and protective roles in vivo.

Marinating Meat in EVOO before Roasting

Another traditional process in the Mediterranean cooking style is marinating meat and fish in oil, wine and herbs (oregano, rosemary) before roasting and the use of an oil–lemon juice or oil–red wine emulsion during the cooking to wet the meat/fish surface (Figure 44.7). This tradition, in part lost today in home and restaurant practice, has been demonstrated to have a protective effect against protein degradation during the thermal treatment of cooking (Monti et al., 2001; Persson et al., 2003; Vitagliano and Fogliano, 2004). Both phenol compounds and EVOO added to model systems simulating cooking show a notable inhibition of heterocyclic amine (HA) formation. Mutagenic HAs are formed at low levels during cooking of meat and fish, and some of these are considered to be possible human carcinogens. The formation of HAs may be affected by the presence of synthetic or naturally occurring antioxidants. Monti et al. (2001) studied the effect of EVOO phenolic compounds, identified and quantified by...
LC-MS, on the formation of HAs in a model system. An aqueous solution of creatinine, glucose and glycine was heated in the presence of two samples of EVOO differing only in the composition of phenolic compounds. The addition of EVOO to the model system inhibited the formation of HAs by between 30% and 50% compared with the control. Fresh-made olive oil, which contained a high amount of dihydroxyphenylethanol derivatives, inhibited HA formation more than a one-year-old oil did. The inhibition of HA formation was also verified using phenolic compounds extracted from virgin olive oil (VOO), demonstrating that phenol-rich EVOO can play an interesting functional role during meat and fish cooking/roasting in preventing the formation of potential carcinogenic molecules. This function should also be applied in modern Mediterranean-like food design and development of novel foods in which the role of EVOO can be used in cooked foods to protect against protein degradation.

Cooking in EVOO (Deep-Frying, Pan-Frying, Sautéing, Sofrito)

EVOO is commonly used in traditional Mediterranean cooking processes in different amounts and at different time-temperature combinations: from deep-frying (a few minutes at 170–180 °C) (Figure 44.8), to pan-frying (20 min at 120 °C) and sautéing (a few minutes at 90–100 °C in the presence of water). In these cooking techniques, there are also exchanges of matter between the oil and the cooked food, with complex chemical, physical and chemical-physical interactions.

Deep-frying in EVOO showed some functional effects: (i) the uptake of triacylglycerols rich in oleic acid and healthy biophenolic antioxidants in the crust of fried-in-EVOO foods, (ii) the minimization of the production of potentially toxic compounds (acrylamide, hydroxy-alkenals), (iii) the protective action of EVOO antioxidants during frying on other food ingredients (carotenoids in vegetables, fatty acids in meats), and (iv) exchange of lipids, when fatty foods are fried with EVOO and the meat lipids are lost in the frying bath (i.e., saturated fats from meats, PUFAs for fish) and absorption of frying oil on the crust with an increase in monounsaturated fatty acid (MUFA) content in fried foods.

The biophenolic compounds of EVOO are quite stable during deep-frying, being found even after several hours of frying (Della Medaglia et al., 1996; Ambrosino et al., 2002). They can interact with the food matrix, inhibiting the formation of dangerous compounds (acrylamide, toxic aldehydes).

The relationship between phenol compounds in EVOO and the formation of acrylamide in potato crisps was first investigated by Napolitano et al. (2008). The phenolic composition of 20 EVOO samples was screened by LC-MS, and four oils, characterized by different phenol compound patterns, were selected for frying experiments. Slices of potatoes were fried at 180 °C for 5, 10 and 15 min in EVOO, and the acrylamide content was determined by LC-MS. EVOO phenolic compounds were not degraded during frying, and the crisp colour was not significantly different among the four EVOO. Acrylamide concentration in crisps increased during frying time, but the formation was faster in the oil having the lowest concentration of phenolic compounds. Moreover, the EVOO having the highest concentration of ortho-diphenolic compounds was able to efficiently inhibit acrylamide formation in crisps from mild to moderate frying conditions. The use of ortho-diphenolic-rich EVOOs was proposed as a reliable mitigation strategy to reduce acrylamide formation in domestic deep-frying. Interestingly, the presence of EVOO phenolic compounds is also able to reduce the formation of acrylamide in low-moisture systems such as biscuits in oven cooking (Arribas-Lorenzo et al., 2009).

Hydroxy-alkenals are other potentially toxic and carcinogenic compounds arising from the thermal decomposition of PUFA s during frying (Frankel, 1998). By high-resolution proton nuclear magnetic resonance (1H-NMR) spectroscopy (400–600 MHz), hydroperoxide decomposition products in thermally oxidized oils were quantitatively analysed (Sacchi et al., 2006). Different oils (EVOO, sunflower and soybean) heated in a thermostatic bath fryer (180 °C for 360 min) showed the NMR signals of aldehyde (n-alkanals, trans-2-alkenals, 4-hydroxy-trans-2-alkenals and alka-2,4-dienals) and were monitored in 15 oil samples (0, 60, 120, 240 and 360 min heating). The 4-hydroxy-2-alkenals were not detected (threshold 0.1 mM/L) in EVOO after 6 hours’ heating, but only in PUFA-rich fried oils. The formation of this compound, in fact, was related to the decomposition of conjugated hydroperoxydienes arising from the oxidation of PUFA s (Frankel, 1998). In olive oil, the low amount of linoleic (5–10%) and linolenic (less than 1%) acids explains these findings. For the same reason, alka-2,4-dienals were formed in small amounts (1.1 mM/L oil after 6 hours’ heating) compared with polyunsaturated seed oils.

In terms of the uptake of phenol compounds in fried-in-EVOO foods, the crust of French fries, when EVOO was used as frying
oil in continuous frying, was demonstrated to absorb a significant amount of phenol compounds, which can be easily extracted from the fried potatoes and quantified by LC-MS (Savarese et al., 2006).

Kalogeropoulos et al. (2007a) studied the behaviour of finfish, representing the most popular fish species in Greece, during pan-frying in VOO. Analyses for polyphenols, hydroxy pentacyclic triterpene acids (HPTA) and α-tocopherol were performed in the fresh and fried oils and fish. Nine polyphenols were determined in the frying oil samples; six of them were also found in fried fish. The terpenic acids oleanolic, maslinic and ursolic acid were also determined in frying oils and fried fish. Besides water loss and oil absorption, pan-frying caused the partial loss of all the antioxidants studied in the fried oils, as well as their enrichment in the fried fish. The polarity of the antioxidants studied affected to some extent their partitioning between the frying oil and the water-containing fish.

The same authors (Kalogeropoulos et al., 2007b) studied potatoes, green peppers, zucchini and eggplants shallow-fried in EVOO according to traditional Mediterranean culinary practice. Zucchini and eggplants were also blanketed with wheat flour or batter prior to frying. Among 12 polyphenols determined, tyrosol predominated in frying oils and zucchini samples, while chlorogenic acid was the major phenolic species in the other vegetable samples. Besides water loss and oil absorption, shallow frying resulted in partial loss of all the antioxidants studied in frying oils and enrichment of fried vegetables with olive oil antioxidants, which was to some extent affected by the type of vegetable fried and the culinary practice followed. The overall retention of the antioxidants in oil and food ranged from 32% to 64% for alpha-tocopherol, from 25% to 70% for polyphenols and from 35% to 83% for HPTA. Vegetables fried in EVOO provide an additional intake of alpha-tocopherol, terpenic acids and polyphenols such as tyrosol and chlorogenic acid.

The performance of VOO and a commercial vegetable shortening was also investigated by Andrikopoulos et al. (2002a) during ten successive pan-fryings of potatoes at 180 °C for a total period of 120 min. For both the oils tested, the effect of pan-frying was worse than the effect of deep-frying. The same was true for visible spectrum and total phenols in VOO. Both oils performed similarly during pan-frying, while VOO performed better during deep-frying. A very strong correlation between octanoic acid formation and total polar artefacts in the whole data set was observed.

Andrikopoulos et al. (2002b) also submitted VOO, sunflower oil and a vegetable shortening to deep-frying and pan-frying of potatoes, for eight successive sessions, under the usual domestic practice. The frying oil absorption by the potatoes was determined to be within 6.1–12.8%, depending on the oil type and the frying process. The retention of total phenolics ranged from 70–80% (first frying) to 20–30% (eighth frying). Tannic acid, oleuropein and hydroxytyrosol-elenolic acid dialdehydic form showed remarkable stability in all frying sessions for both frying methods, while hydroxytyrosol and hydroxytyrosol-elenolic acid were more rapidly eliminated. The deterioration of the other phenolic species was 40–50% and 20–30% for deep-frying and pan-frying, respectively, after three to four frying sessions, which is most usual in the household kitchen.

The migration of health-promoting micro-constituents from frying vegetable oils to French fries was also studied by Chiou et al. (2012), who analysed the behaviour of vitamin E in this thermal process. EVOO, water and a water/oil mixture (W/O) were also used for frying, boiling and sautéing Mediterranean vegetables (potato, pumpkin, tomato and eggplant) by Ramírez-Ayala et al. (2019). Differences in antioxidant capacity (AC) and levels of individual phenols in unused and used EVOO and water were determined. The water used to boil tomatoes showed the highest phenolic value, whilst the lowest was found in the EVOO from the W/O used for boiling potatoes. After processing, the concentrations of phenols exclusive to EVOO diminished to different extents. There was a greater transfer of phenols from the vegetable to the oil when eggplant, tomato and pumpkin were cooked. W/O boiling enriched the water in most of the phenols analysed, such as chlorogenic acid and phenols exclusive to EVOO. The values of AC decreased or were maintained when fresh oil was used to cook the vegetables (raw > frying > sautéing > boiling). The phenolic content and AC of EVOO decreased after cooking Mediterranean diet vegetables. Furthermore, water content was enriched after the boiling processes, particularly when oil was included.

Lozano-Castellón et al. (2020) studied how temperature, time and the interaction between these affect the EVOO polyphenolic profile during a domestic pan-frying process, simulating the cooking conditions in a home kitchen without control of light or oxygen. EVOO was processed at two temperatures (120 °C and 170 °C) for either a short time (30 min) or a long time (60 min), and the polyphenol content was monitored. Temperature degraded the polyphenols of EVOO during the sautéing, whereas time had an effect on some individual phenols, such as hydroxytyrosol, but not on the total phenol content. The polyphenol content decreased by 40% at 120 °C and 75% at 170 °C compared with raw EVOO.

In a study by Vallverdú-Queralt et al. (2013), different Mediterranean sofritos were also analysed for their content of polyphenols and carotenoids. Simple phenolic and hydroxy-cinnamoylquinic acids, and flavone, flavonol and dihydrochalcone derivatives, were identified in Mediterranean sofrito. The quantification levels of phenolic and carotenoid compounds led to the distinction of features among different Mediterranean sofritos according to the type of vegetables (garlic and onions) or olive oil added for their production.

All these studies confirm the active role of EVOO in Mediterranean frying and cooking, with an exchange of antioxidants with the cooked ingredients (O/W partitioning), and its protective role against thermal oxidation and preservation of functional components during cooking.

EVOO and Milk Proteins

Interactions between EVOO compounds and milk proteins can also occur, modifying the sensory perception and nutritional
quality, not only in cooking but also when mixing EVOO with milk, fresh cheeses or ice cream at room or low temperature.

Meynier et al. (2004) demonstrated that hexanal and t-2-hexenal, volatile compounds found in high amounts in EVOO, form covalent bonds with whey proteins and sodium caseinate, causing changes in the amino acid composition of proteins. A similar behaviour can be observed from the interaction between EVOO phenolic/volatile compounds and milk protein, with a decrease of the perceived ‘bitterness’ ‘pungency’ and ‘green-grass’ attributes in food systems containing milk, cream and ricotta cheese, as well as in artisanal ice-cream made with EVOO (Sacchi et al., 2019) (Figure 44.9).

Another important issue is the perception of volatile and non-volatile (biophenols) compounds in relation to oil-in-water emulsions. In the case of emulsions, hydrophobic flavour components can be perceived at lower concentrations in water than in oil, and many of the lipid oxidation products show high solubility in oil phase (Beltran et al. 2005). In food systems in which EVOO and milk proteins are present, these interactions cause strong modifications of the sensory properties of EVOO, with an evident loss of bitterness and pungency and good acceptability of ice-cream (Sacchi et al., 2019).

Conclusions
The scientific studies discussed here demonstrate an active functional role of EVOO, not only as a source of antioxidants when used as a raw ingredient in the Mediterranean Diet but also in protecting other food components during cooking. The use of raw EVOO added to foods after cooking (or as a salad oil) is the best way to express the original flavour and to maximize the intake of natural antioxidants and compounds related to positive effects on human health. EVOO, however, also exhibits its protective properties during/after cooking. Different chemical interactions between EVOO biophenolic compounds and other food ingredients (e.g., water, milk proteins, carotenoids of tomato, omega-3 PUFAs in canned-in-oil fish, meat or fish proteins) occur and may positively change sensory and nutritional properties of cooked Mediterranean foods.

Several positive interactions with other food components (carotenoids, omega-3 PUFAs and proteins) occur, and cooking foods with EVOO can improve their nutritional quality and anticarcinogenic effects, as has been well demonstrated for cooked tomato–EVOO mixtures (Lee et al., 2000).

The physical (partitioning, emulsion) and chemical (hydrolysis, covalent binding, antioxidant properties) phenomena occurring during cooking of EVOO, discussed here with an emphasis on the changes in sensory (bitterness and fruity) and nutritional quality of traditional Mediterranean foods, can contribute to understanding the basic molecular keys of the ‘magic’ of EVOO and its role in traditional and modern Mediterranean gastronomy.

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