

OLIVE OIL AND FRIED FOOD, RESPECTING THE MEDITERRANEAN DIET

by **Maria Cristina Solfizi**

expert and analyst in the field

Man started to cook his food just to make it more tasty in fact he boiled, roasted, smoked and fried it. The fat reaches high temperatures while frying the food. After some experiments, Varena and colleagues demonstrated that while frying, the temperature keeps constantly about 100 °C, until the water contained in the food is completely evaporated. In fact it is necessary that water evaporates for the most part, or completely, to make the heated fat penetrate inside it. For this reason the real action-time of the heated fat on the food is very brief and this shows that the thermal damage provoked by frying is not worse than the one caused by other cooking techniques and in some cases it seems to be minor. Anyway, when we talk about alterations coming from frying fats we should distinguish the ones caused by excessive temperature (overheating) and the ones that really happen while frying food. That is why it is important to know which alterations can happen on lipids and how much these alterations can affect our health.

High temperatures, with the atmospheric oxygen, put in evidence these self-oxidation phenomena that fats are usually used to, even at normal temperatures. These phenomena depend on the level of fat un-saturation and the presence of pro-oxidant substances, while they are fought by the antioxidant elements. Even if the animal fats get a low un-saturation grade, they have a rapid self-oxidation process, because they lack anti-oxidant agents, also seed-oils have this rapid process because though they contain a good quantity of anti-oxidant agents (as tocopherols), they present a high degree of un-saturation; the olive oil, instead, has a stable behaviour against the attack of the atmospheric oxygen because, beyond having a middle-stage degree of un-saturation, it contains also anti-oxidant substances (α-tocopherol and polyphenols). Some other researches have established that the stability of the olive oil is maintained also at high frying temperatures, while the seed oil isn't, not only for the presence of the anti-oxidants, but even because they are rich in oleic acid. In fact the polyunsaturated fatty acids are subdued to the thermo-oxidative damage; this depends on the un-saturation degree of the olive oil but also on

the double bonds present in the single chain of the fatty acid: while a saturated fatty acid has a low developing speed, let's suppose to be 1, the mono-unsaturated speed is 10, the double unsaturated is 100 and the three-unsaturated 10.000. Besides, the unsaturation level, the degree of fat alterations depends on the degree of temperature, the time of heating, the nature of the cooking food (it can lose some elements) and on the presence of catalysers. The products of alteration that grow in the heated fats are peroxides, aldehydes, ketones, hydroperoxide, polymers. Each of these elements can cause toxic effects even if the aldehydes and the ketones being volatile, can be easily eliminated and the polymers can be hardly absorbed. The toxic effects can affect the stomach, the liver, the cardio-circulatory system, the reins and even the animal's growth-speed. Finally it must not be forgotten that even the nourishing values of cooked food can result damaged.

Biologic effects of thermo-oxidised fats

The studies on the toxic effects of the degradation products of thermo-oxidated fats have been almost exclusively made on animals, almost always in hard conditions, using the frying fat as only lipid source, treated at high temperatures for many hours. For this reason it is difficult to transmit these experiments on men, even if some considerations seem quite interesting. As already said, the major chemical-physic alterations regard the polyunsaturated fatty acids and are caused by peroxidative phenomena that can be limited by the anti-oxidant agents. For its medium-degree unsaturation and the presence of anti-oxidants, the olive oil has a privileged situation because it needs particularly high and long temperatures to provoke evident alterations. In fact, some studies on different kinds of fat put in evidence how the assumption of saturated and polyunsaturated fats (butter and sunflower), heated at 170°C for 2 hours, affected the liver, while this damage wasn't present with the assumption of monounsaturated fats (olive oil) with the same heating. On the contrary all the three kinds of fats (saturated, lard, monounsaturated: olive oil; polyunsaturated: corn oil) heated at 180°C for a longer period (72 hours) provoked serious alterations to the liver. The behaviour of heated fats on the cardio-circulatory system seems interesting. Besides the possible damages of the heart and of the artery wall provoked by the peroxide fats, an alteration of the balance prostacycline/ thromboxane in favour of the last, with an increase of the platelet aggregation, a phenomenon that can be prevented with vitamin E. Even the plasmatic lipids can be affected by the kind of fat used for cooking. Kritchevsky and colleagues studied the effect of the olive oil, raw and cooked for 20 minutes at 215°C, associated with a diet enriched with 2% cholesterol moulded in the oil. Through these experiments, the

researchers have concluded that the olive oil heating causes only a light increase of atheromasia, while the oil is surely more atherogenetic.

As regards the effect on the bile, a study made by Charbonnier showed that the oil, heated at 200°C for 3 hours, doesn't lose its colestercinetic properties. In fact when healthy volunteers were given, through a duodenal probe, 40ml of heated virgin olive oil raw or cooked he could demonstrate that there are no differences between raw or cooked oil, both for its choleric and colagogic properties, even for the bile that is modified by more unsaturated oils. Finally Varena and colleagues' studies seem important about the mechanism of penetration of the olive oil into food, while frying. The result was that the oil doesn't penetrate the food, it was absorbed only in the peripheral parts, while other fats wholly penetrate it. Moreover the digestibility of the cooked olive oil doesn't change, even after frying meat or sardines ten times, as the authors proved. In conclusion, there is much evidence of the olive oil suitability for frying because of its resistance to the oxidative damages causing fewer problems to our health.

The Mediterranean diet

Even if the alimentary fats play an important biologic role, they can not be considered apart from the whole food-habits both for their caloric support and for their relation with the other nourishing elements. In the industrialized countries the excess of calories is wide-spread (both for the bigger quantities of food everyone has, and for the lack of physical activity) there is also no balance among the nourishing elements. The consumption of the lipids increases with the rise of the saturated fatty acids; the monounsaturated fatty acids are more consumed than the polyunsaturated: the consumption of the glycols decreases but the oligosaccharides increase; animal- origin- food is more common with a major introduction of high- value proteins, but at the same time a major introduction of invisible saturated fats; fresh vegetal food is stored, frozen, or it is cooked losing its vitamins and mineral value: the definition of this food further reduces the vitamin content and the vegetal raw fibres. All these modifications, caused by the technological progress, or by the diffusion of the "fast-food", by the changes in taste and habits, have negative influences on people's health with an increase of metabolic diseases. For this reason it is necessary to stop these new food-habits and advice people to have a more balanced diet, as for example the Mediterranean. In fact this diet is characterized by a modest consumption of meat and milk-products, by a further use of complex glycols, fruit and fresh vegetables (containing not only vitamins and minerals, but also fibres). A good consumption of fish and as regards the lipids, by a prevailing assumption of olive oil. For its balanced

composition, the olive oil has a protective effect on the arteries, on the stomach, on the liver; it helps children's growth and improves life hope, giving, at the same time, the right satisfaction as for taste. Finally, we can conclude with a fine story, between truth and legend: one day the plants joined together to elect a king. After a long discussion they agreed to vote for the olive-tree, but this refused this task, even if it was very happy, answering: "I was given an important mission by god for mankind's health, I can not spend my time on the state business".

Olive oil and childhood

The breast-nursed baby gets about 50% of the lipid calories, from which about 10% is represented by the polyunsaturated fatty acids. The boy still needs some lipids even if not all the paediatricians agree with the same quantity, some of them say it must be similar to adults. Even on the choice of alimentary fats the doctors don't agree; some think that the two/ third should be vegetal, the European Society of Gastroenterology and Nutrition (Span) affirms that there is no scientific evidence, which can advice animal or vegetal fats. There are some different opinions even for the essential fatty acids, the Society for Nutrition of the American Academy of paediatricians think 300 mg every 100 calories are necessary, they consider the quantity between 300 and 1200 mg every 100 calories as the most advisable, while the 'Span' indicates 3-6% on the whole. The lack of essential fatty acids is not so common, especially for children, but a scarce support of linoleic acid can cause the growth to be slower, and furthermore, it can cause skin, liver and metabolic troubles. It must be underlined that the baby gets 4-5% of the calories as polyunsaturated fatty acids, the baby that is not breast-fed with low milk, has a sharp low quantity, because this milk contains only 2% linoleic acid. As there are some deficiencies, doctors have tried to cure them "humanizing" it with some vegetal oil. The seed oils are generally rich in polyunsaturated acid, it is for this reason that they are so advisable for the baby's feeding. Now parents are said not to give the children high quantities of polyunsaturated, because if the decrease of cholesterol is a good thing for the adult, it can't be said the same for the children, particularly for immature children who do not own sufficient reserves of vitamin E. In these people, in fact, a form of haemolytic anaemia was observed, diagnosed after the assumption of oils containing polyunsaturated fats, caused by the breaking of the membranes of red blood cells after the per-oxidation of the polyunsaturated entering the composition of phospholipids in the cell-membranes. The balance between the linoleic and alino lenic acids is very important because an excess or a lack can determine troubles on the nervous system because they disturb the enzymes(desaturasis), necessary for the length and duration of the chain, the elongation of the a-

linolenic acid can be inhibited with a reduction of the synthesis of eicosapentaenoic and decosaenoic acids; they are key-elements of the brain tissue. In fact comparing the effects of the olive oil, of the sunflower oil and of acids given to developing rats, Galli registered the appearance of serious alterations of structural lipids of the brain and the liver in the two groups treated with sunflower oil, but not in the one treated with olive oil. The studied modifications are basic to infer that developing tissues ask for an adequate introduction of essential fatty acids. Even aging is driven by an infra-cellular deposit of lipofusine, a pigment coming from the polymerization of per-oxidized fatty acids. Diets lacking vitamin E increase the formation of peroxides; on the contrary, adding anti-oxidants the formation of free radicals diminishes and favours a longer life for various species of animals. Particularly Harman's researches demonstrated that linoleic acid quantities, higher than 2% of the calories and of α -linoleic acid superior than 0,5 trouble the brain functions of the animal and can favour the senile dementia. On the contrary, the same author showed in the mice fed with olive oil that the life-span is superior than the mice fed with sunflower oil and corn oil, probably for the good relation vitamin E/ polyunsaturated existing in the olive oil. Harman's researches, transferred to men, confirmed by several researchers, can advise us some prudence in the use of oils containing polyunsaturated fatty acids, and prefer the olive oil among all the other types of fats, for its balanced content in linoleic, α -linoleic and anti-oxidant elements. Pinchey's works, in particular, in the course of a survey on the modification of the skin with the passing of time, stress how 78% people consuming a diet with over 10% polyunsaturated presented evident early aging signs and had an older physical appearance than the chronological age. In this group 60% of the cases had been operated to one or more skin-lesions, suspected as serious. Another great problem is the one linked to the calcium in the bones. Even in this case the olive oil seems to have a favourable effect, that, according to Laval-Jeantet's studies, could depend on the quantities because the higher the consumption, the better the mineralization of the bones. There are some hypothesis to explain this positive effect of the olive oil; the authors make two hypothesis, but the most important thing is that there is a high quantity of oiled among the structural lipids of the bones. It is necessary to grant a good alimentary bi-oiled support, together with a modest quantity of essential fatty acids, as confirmed by studies made in the south of France. This support is perfectly realized with a diet containing olive oil. The olive oil is, according to the French researchers, fundamental for the body's development, but even during adulthood, it limits the lack of calcium due to the aging process. As for old people, there is also the problem linked to the vascular sufferance of the brain.

We won't stop too much on this theme, dealt with in the next chapter, we want to underline that in the vascular disease of the brain the atheronic risk doesn't seem to be consequent to the increase of total cholesterol but to the decrease of the values of HDL cholesterol. Even in this situation the olive oil is particularly advisable because it favours the increase of the HDL cholesterol. We can not forget that during the old age there is a general reduction of the digestibility and a bad absorption of nourishing elements, particularly vitamins and mineral salts. If we examine the pros and cons of the oils versus all these needs, we realize that the oil has all the necessary characteristics for all its qualities, for its laxative action. The olive oil can be freely consumed, cooked or even better, raw, as to store its vitamin and antioxidant treasure. It improves also the taste of food, over all vegetables, supporting it with vitamins, mineral, salts and raw fibres.