



Frying oils



Introduction

Frying is an ubiquitous and versatile method of cooking, which brings unique sensory characteristics to food. Hence, it is one of the most commonly used methods of cooking in Europe.

Consumption of fried food should be considered as part of an overall balanced diet, and in this context, fried foods should be eaten with moderation.

Frying implies the use of oils or fats that serve as both ingredient and heating medium.

- Deep frying is defined as the cooking by immersion of a food in oils or fats that are heated to between 140°C and 180°C and the repeated use of the frying medium.
- Pan frying implies the use of a small amount of oil or fat to lubricate a pan in which the food is cooked on each side.

Fried foods can be consumed at home or away from home (in traditional or fast-food restaurants, for example).

Frying modifies both the food and the frying medium

Frying improves the sensory appeal of food, especially by giving food a crunchy texture and rich taste. During frying, a double transfer takes place: water is released from the food and oil or fat enters into the food. In addition, during deep frying, the food is subject to chemical and physical transformation at high temperature, which can result in diverse effects¹. Over repeated frying cycles, the frying medium deteriorates due to processes such as oxidation and polymerisation, which lead to changes in the performance of the oil or fat.

(1) Such as dehydration, starch gelatinisation, protein denaturation, and coloration and aromatisation via the Maillard reaction.

(2) Opinion of the Scientific Panel on Dietetic Products, Nutrition and Allergies on a request from the Commission related to the presence of trans fatty acids in foods and the effect on human health of the consumption of trans fatty acids Request N° EFSA-Q-2003-022), adopted on 8 July 2004, doi:10.2903/j.efsa.2004.81

Frying patterns vary considerably according to regions, traditions and dietary habits across Europe. In particular, the type of oils or fats used can be very different due to availability and cost, the type of fried foods (French fries, croquettes, doughnuts, etc.), the frying technique, and the re-use of the frying medium.

Nutritional aspects of frying

During frying, water in the food is lost and fat is taken up, which increases the calorie content of the food. The fatty acid profile of the food may also change depending on the choice of the frying oil/fat.

Because of the higher fat content and increased caloric density of fried foods, their consumption is usually considered to be unhealthy, and is often associated with increasing levels of obesity and cardiovascular disease risk. However, few studies have evaluated a direct association between fried foods and chronic disease risk, and their results have shown wide variations. The variability in obtained results could be due for example to the type of oils or fats used for frying, the quantity of consumed fried foods, the frying technique (for example, single use or re-use of the frying medium), or the study criteria (i.e. evaluating the effect of fried foods or the effect of fried foods associated with other foods or dietary patterns).

Frying can also be associated with increased levels of *trans* fatty acids in foods. *Trans* fatty acids are a type of unsaturated fatty acids, which have been linked to potential health risks². In the past, partially hydrogenated fats, which have elevated levels of *trans* fatty acids, were often used as frying medium because of their high oxidative stability. Over the years however, most of these fats have been replaced with other vegetable oils and fats containing virtually no *trans* fatty acids.

Although there are no clear conclusions on the impact of fried foods on health, it is recommended to moderate their consumption as part of an overall balanced diet.



Factors influencing the absorption of oil/fat during frying

In order to align food development with consumer trends towards healthier, lower-fat products, it is important first of all to gain an understanding of the mechanisms underlying oil or fat uptake into food during frying. The challenge, ultimately, is to be able to reduce the fat content of the fried food without compromising on texture and taste.

The uptake of oil or fat by the food depends on several factors such as the following:

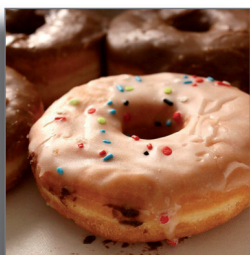
- The ratio between the exchange surface food/frying medium and the volume of the food: the oil/fat absorption increases when the thickness of the food decreases and the volume increases.
- The dry matter of the food: the higher the amount of moisture leaving the food, the higher the oil/fat absorption since vapour leaves voids (or channels in the surface of the food) for the oil/fat to enter in.
- The duration of frying: influencing both the water loss and oil/fat absorption.
- The frying temperature: higher temperatures mean less absorption of oil/fat, because the force of the steam trying to escape from the food pushes against the migration of the oil/fat into the food.

Quality and safety aspects

Increased degradation of the frying medium occurs at higher cooking temperatures and with the number of re-use cycles.

Degraded lipidic compounds, such as free fatty acids, mono- and diacylglycerols and polymers may affect the quality of the frying medium. Moisture and residues from previous fryings also have an impact on the quality of the frying medium.

To minimize deterioration of oil/fat during the frying process, choosing the right type of frying medium as well as applying good frying practices are key¹.



The choice of frying oil/fat

The choice of frying medium is key to ensure the consumption of fried foods that are as safe and nutritionally acceptable as possible. Consequently, the choice should be based on the most appropriate balance between heat stability and nutritional properties.

Vegetable oils that have high content of polyunsaturated fatty acids such as rapeseed, soybean or sunflower oils are nutritionally more favourable but are sensitive to oxidation and thus should only be used for a very limited number of repeated fryings.



Palm oil, which contains more saturated fatty acids, presents higher heat stability, but may be less acceptable nutritionally. The ideal frying medium may therefore be a blend of several oils or fats that have complementary properties.

Also, high oleic sunflower oil, high in monounsaturated fatty acids and presenting high heat stability, is increasingly used for frying.



(1) See in particular DGF Optimum deep-frying, Recommendations by the German Society for Fat Science, November 2012 or ITERG Information Documentation. Frying at home – Precautions to be taken.

FEDIOL, the EU Vegetable Oil and Proteinmeal Industry, is the Federation representing the interests of the European oilseed crushers, vegetable oils producers/processors and protein meals producers. With more than 35 companies in 16 EU countries, FEDIOL members crush 36 million tonnes of oilseeds a year, and refine 17.5 million tonnes of oilseed/soybean oils and tropical oils, which amounts to 90% of the European food market for vegetable oils and fats (excluding olive oil). There are more than 150 vegetable oils and fats production facilities across Europe, employing approximately 20 000 people.