



The role of vegetable oils and fats in a balanced diet



Some definitions

There is no official definition for **what is an oil and what is a fat** in the EU legislation. However, in the common practice they are differentiated based on their physical state at room temperature. Oils are generally liquid and fats solid at normal room temperature (20-25°C). Some tropical products, like palm oil and coconut oil, liquid at origin, become solid in our climates, but their names are kept as originally given.

The term **fat** refers to the nutrient, providing the body with energy, helping maintain body temperature, and protecting body tissues and organs. "Lipids" is another name for the nutrient fat.

Fatty acids are the building blocks of the fat we eat and of the body fat. Fatty acids are chains of mainly carbon and hydrogen. They are usually joined to a glycerol backbone in groups of three, forming a molecule called a triglyceride. Fatty acids vary in chain length and degree of saturation of their chain. They are named according to their degree of saturation: saturated fatty acids, monounsaturated fatty acids or polyunsaturated fatty acids (omega-6 and omega-3 fatty acids).

Oils and fats: all the same?

- **Yes**, in terms of calories. Oils and fats are only composed of the nutrient fat that provides the same amount of energy.
- **No**, they do not have all the same nutritional properties which depend on the nature of the different fatty acids they contain. The various fatty acids play specific roles in the body and thus the amount and types of fatty acids in the oils and fats have important implications from a nutritional perspective. Oils and fats also differ in the amounts of fat-soluble vitamins (such as vitamins E and K) that they naturally contain.

Are some vegetable oils and fats less fatty than others?

No, except for fat spreads, margarines and mayonnaise that are emulsions of oils and water, all vegetable oils and fats consist of lipids and thus provide the same amount of energy, i.e. 9 kcal per gram or 90 kcal per soup spoon (10 g).

The classification of fatty acids is based on their chemical structure

- The major **saturated fatty acids** in the European diet are myristic, palmitic and stearic acids, fatty acids with 14, 16 and 18 carbon atoms, respectively.
- There is one major **monounsaturated fatty acid** or omega-9 fatty acid in the European diet: oleic acid.
- Our diet includes two types of **polyunsaturated fatty acids**: mainly linoleic acid which is an **omega-6 fatty acid** and a lower proportion of alpha-linolenic acid which is an **omega-3 fatty acid**. The diet also includes very low amounts of **long chain omega-3 fatty acids** such as EPA and DHA, the intake of which depends mainly on the presence of seafood and enriched oils and margarines in the diet.
- **Trans fatty acids** are a mono- or polyunsaturated fatty acids in which hydrogens have different positions on the carbon chain resulting in different physical properties and shape. They are thus not included in the categories of mono- and polyunsaturated fatty acids.



The proportions and types of fatty acids in a vegetable oil or fat vary depending on the specific seed or fruit from which they are obtained. The fatty acids that predominate not only determine the nutritional properties but also the physical characteristics and appropriate use of specific oils and fats. The unsaturated fatty acid content of vegetable oils determines their fluidity and other physical and chemical properties of relevance to the food industry. Oils rich in monounsaturated fatty acids (e.g. high oleic sunflower oil) are more suitable for frying than oils rich in polyunsaturated fatty acids (e.g. soybean oil) since they are more heat resistant. Vegetable fats are rich in saturated fatty acids which means that they have a higher solid fat content, a property that is required in some food applications (e.g. consistency of fat spreads, formation of layers in pastry).

Where can you find fat in the diet?

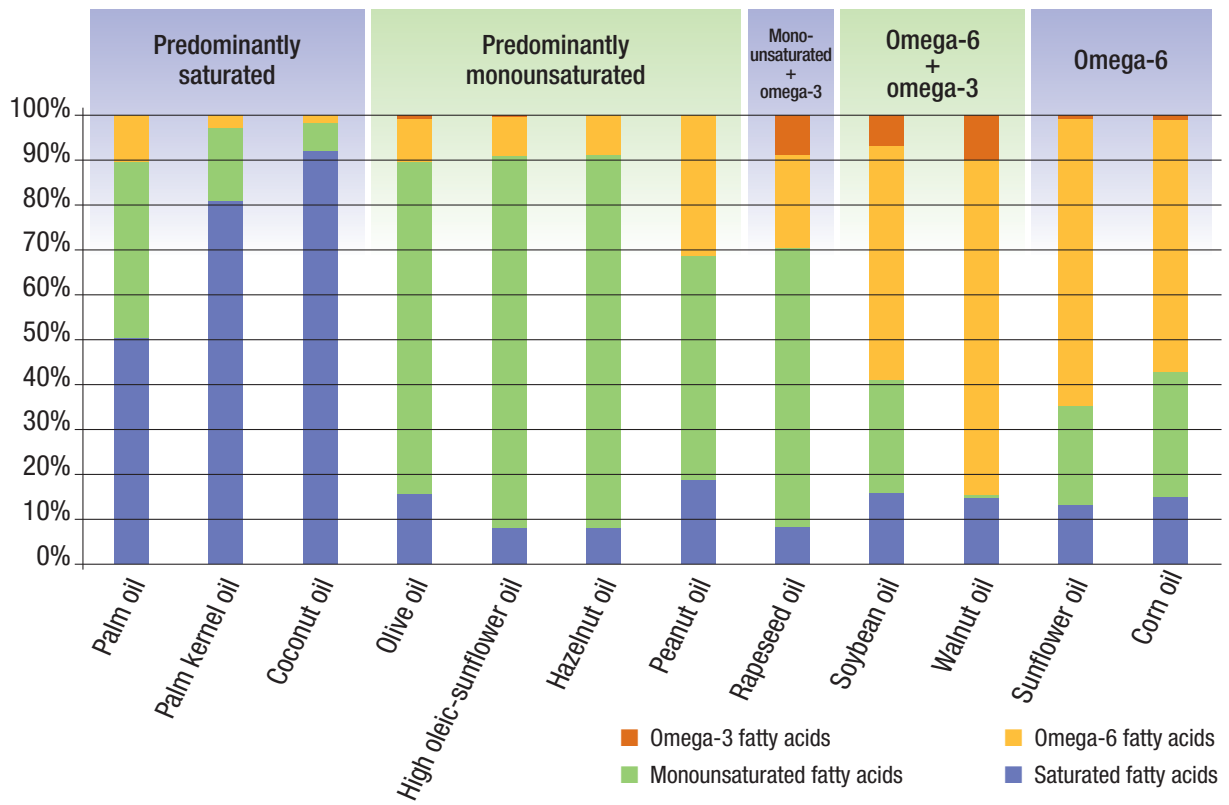
Fat can be easily visible in the diet, e.g. vegetable oils, butter, margarines. It can also be “invisible” or “hidden” when present in more complex foods, e.g. cheese, meat (products), bakery goods, ready meals, etc.

Visible and invisible fat can be of vegetable or animal origin.

The consumption of vegetable oils (type, usage) is different according to national habits. However, vegetable oils have a common property: they contain mainly monounsaturated and polyunsaturated fatty acids. Polyunsaturated fatty acids should be privileged in the diet (FAO, 2010).

Vegetable fats are mainly used as ingredients bringing specific functions in foods, e.g. texture, brittleness, crunchiness, specific mouth feeling, etc.

Classification of vegetable oils and fats according to their fatty acid profiles





Why are omega-6 and omega-3 fatty acids called essential fatty acids?

Omega-6 and omega-3 fatty acids are essential nutrients because the human body is unable to synthesize them and it needs each of them every day. They can only be obtained through a balanced diet. The amounts and balance of omega-6 and omega-3 fatty acids in the diet are important as they can impact the body's functions, such as blood pressure, blood clotting, blood lipid levels, immune response and the inflammation response to injury infection. A proper amount and balance of essential fatty acids helps maintain and improve health.

I have only one vegetable oil in my kitchen, is it enough?

Each vegetable oil has its own nutritional properties, e.g. some are rich in omega-3 fatty acids, others rich in omega-6 fatty acids. Vegetable oils have to be consumed every day. Knowing that vegetable oils are the main dietary source of essential fatty acids, it is recommended to vary the source of vegetable oils or to use blends of various vegetable oils to reach the appropriate balance of essential fatty acids.

For some applications requiring heat resistance such as frying, it is recommended to use frying oils containing a high amount of monounsaturated fatty acids.

A better knowledge of the specificities of the vegetable oils will support consumer choice based upon the varieties of taste and nutritional properties.

Could we recognize the nutritional benefits of oils and fats at a glance?

There is a trick easily applicable to recognize oils and fats that contain more unsaturated or saturated fatty acids. The more unsaturated the more liquid, and the more saturated the more solid.

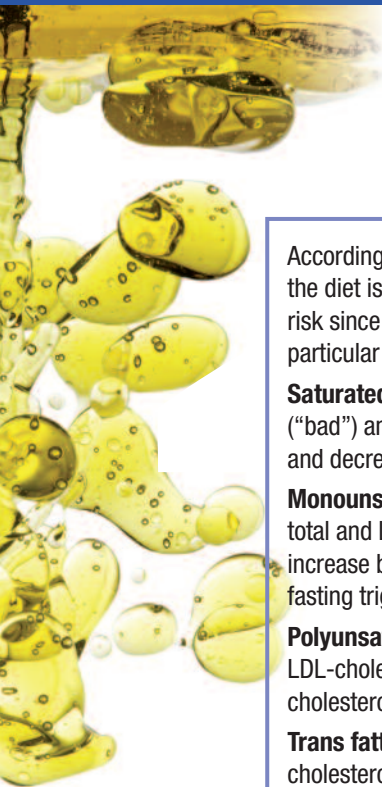
- Sunflower oil, the richest oil in polyunsaturated fatty acids is very liquid.
- Olive oil, less rich in polyunsaturated fatty acids, but very rich in monounsaturated fatty acids, is less liquid.

<i>Oils and fats that</i>	<i>are rich in</i>	<i>are found in</i>
Liquid	Mono and/or Polyunsaturated fatty acids	• Bottled oils
Soft	Monounsaturated fatty acids and saturated fatty acids	• Many foods
Solid	Saturated fatty acids/trans fatty acids	• Dairy products • Hard vegetable fat

What are the recommendations of health authorities regarding the consumption of fat and fatty acids?

Health authorities recommend to moderate fat consumption. Fat intake should be between 20 and 35% total energy intake. In addition to its role of energy provider, fat contributes to the intake of essential fatty acids and fat soluble vitamins. Saturated fatty acid and trans fatty acid intake should be as low as possible in the context of a nutritionally adequate diet. (EFSA, 2010, FAO, 2010).

FAO and WHO specifically recommend that saturated fatty acids should be replaced by polyunsaturated fatty acids (omega-3 and omega-6 fatty acids) in the diet. Vegetable oils or soft margarines rich in these fatty acids should consequently be preferred (WHO, 2003, FAO, 2010). Several countries also specifically recommend to limit the consumption of animal fats and/or use preferably vegetable oils, e.g. Hungary, Poland, Luxembourg, Slovakia, Slovenia, Lithuania.



According to EFSA (2010), the fatty acid composition of the diet is an important determinant of cardiovascular risk since it affects the blood lipid profile, and in particular blood cholesterol.

Saturated fatty acids increase blood total, LDL (“bad”) and HDL (“good”) cholesterol concentrations and decrease fasting triglyceride concentrations.

Monounsaturated fatty acids have a modest blood total and LDL cholesterol-lowering effect. They increase blood HDL-cholesterol and decrease blood fasting triglycerides.

Polyunsaturated fatty acids lower blood total and LDL-cholesterol and slightly increase blood HDL-cholesterol.

Trans fatty acids increase blood total and LDL-cholesterol concentrations and lower HDL-cholesterol.

Do oils and fats only bring calories?

No, vegetable oils and fats are a major dietary source of the essential fatty acids, omega-6 and/or omega-3 fatty acids.

Vegetable oils are the major dietary source of vitamin E and are a good vehicle for the addition of liposoluble nutrients such as vitamin D or DHA.

Olive oil is a source of phenolic components that are antioxidants protecting body cells from oxidative damages.

Oils and fats are mainly used to cook or add flavour to meals

However, did you know that...

- one soup spoon of vegetable oil provides 4-5 % of daily energy needs for an adult?
- the quantity of oil used for cooking or meal preparation does NOT correspond to the quantity ingested? A significant amount of oil always remains on the plate when consuming salads or in the pan when cooking?
- in general foods retain just 10-15 % of oil when deep fried?

Do oils and fats contain trans fatty acids?

In nature, trans fatty acids are only produced by biohydrogenation in the rumen of ruminant animals. Trans fatty acids can also be produced during the processing of vegetable oils and fats. Trans fatty acids are produced in very low amounts during deodorization, which is a necessary step in the process of refining of vegetable oils to remove traces of undesirable substances and odors.

Trans fatty acids are also produced when vegetable oils and fats are hardened via a process called partial hydrogenation: process similar to biohydrogenation in the rumen. However, in order to comply with public health recommendations, the vegetable oil and fat industry has optimized the hydrogenation process to limit the production of trans fatty acids in its products.

It is recommended in several countries that the trans fatty acid level remains below 2 % of the fat content in food products. Vegetable oils currently processed in Europe generally contain less than 1-1.5 % trans fatty acids. Looking at the total diet, most TFA come from products of animal origin (dairy and meat products).

References

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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.