



Nutrition of edible oils and animal foods

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Use oils/fats in moderation; choose a variety of oil seeds, nuts, nutriceals, and legumes to meet daily needs of fats and essential fatty acids (EFA)

Rationale: Using a diverse variety of oil seeds, nuts and whole grains, provides a balance of all fatty acids (lipids). Refined or extracted oils are processed products; hence it is best to use them in moderation.

- Fats are also known as 'lipids'.
- There are three types of fatty acids (FA) in our diets, saturated fatty acids (SFA), mono unsaturated fatty acids (MUFA) and poly unsaturated fatty acids (PUFA).
- Our body can synthesize SFAs, MUFAs besides obtaining them from the diet, while the PUFAs, namely, linoleic acid (also known as n-6 or omega 6 or LA) and alpha linolenic (also known as n-3 or omega 3 or ALA) cannot be synthesized. Hence, n-6 and n-3 are termed essential fatty acids (EFAs).
- Our body depends on dietary sources for n-3 and n-6 FA as they are not made in our body.
- High intake of saturated fats (SF) enhances calorie intake and increases the risk of heart diseases and stroke.
- Trans fats (TF) are harmful and should be avoided.
- Intake of oils and fats should be in moderation. Cooking methods such as sautéing, steaming, grilling, boiling or baking should be used instead of frying.
- To enhance nutrition and flavor, oilseeds and nuts paste (wholesome and nutritious) can be used in place of extracted refined oils/fats.
- Include foods rich in alpha-linolenic (ALA)/n-3 PUFA such as nuts/oil seeds, soyabeans, grains/millet, green leafy vegetables and fenugreek seeds.
- Prefer marine fish such as salmon, mackerel, trout and tuna (~200gm/week) which are good sources of preferred LC n-3 fatty acids.

- Moderate the use of high n-6 PUFA containing oils.
- Limit the use of high saturated-fat containing oils/fats such as ghee, butter etc.
- Minimize consumption of ready-to-eat fast foods, bakery foods and processed foods which may contain trans fats and saturated fats
- Avoid using partially hydrogenated fats (vanaspati) as the cooking medium as they contain trans-fats and saturated fats.
- Repeated heating of cooking oils generates harmful oxidative (polar) compounds and hence must be avoided.

Why do we need fats/oils?

- Lipid or fatty acids perform several important physiological and metabolic functions in the body.
- Lipids constitute major components of many hormones and cell membranes along with proteins and are involved in many important cell-signalling functions and gene expression.

What are the components of fat?

Fatty acids are the simplest types of lipids. Triglycerides, phospholipids, glycolipids and cholesterol are all lipids.

Fatty acids

All fats in foods provide mixtures of three types of fatty acids (SFA, MUFA, PUFA), which are the 'building blocks' of fats. Fatty acids are the primary constituents of all dietary fats in the form of triglycerides. Based on their structure, fatty acids are broadly grouped as saturated fatty acids (SFA), monounsaturated (MUFA) and polyunsaturated (PUFA). Coconut oil, palm oil, ghee, butter, lard, tallow, milk, milk products and meat contain SFA.

Cholesterol is found only in animal-source foods. Cholesterol is synthesized in the liver from carbohydrates and fats in our diet. Liver cholesterol synthesis increases when the cholesterol intake in our diet is low; and the synthesis is suppressed when our intake is increased. Cholesterol is carried by lipoproteins in our blood: low density lipoprotein (LDL) and high density lipoprotein (HDL).

What are the physiological/health implications of different fats/fatty acids?

PUFA (n3 and n6): PUFAs are essential components of cell membranes. While n-6 PUFAs are predominant in all cells, the brain cells and nerve tissue have high levels of n-3 PUFA. The long chain PUFAs of n-3 (Docosa Hexaenoic Acid, DHA and Eicosapentaenoic Acid, EPA) are essential for brain and nerve tissue. They are found in fish oils and fish products. The brain and nerve tissue have high levels of n-3 PUFA. The long chain PUFAs of n-3 (Docosa Hexaenoic Acid, DHA and Eicosapentaenoic Acid, EPA) are essential for brain and nerve tissue. They are found in fish oils and fish products.

n-3 PUFA: The long chain PFAs of n-3 (Docosa hexaenoic Acid-DHA and Eicosa Pentaenoic Acid-EPA) and n-6 (Arachidonic acid-AA) are essential during growth and development. During the fetal and early infant development, there is a rapid accretion of AA and DHA in infant brain, DHA in retina and AA in the whole body for meeting the demands of rapidly growing tissues/ organs. Small amounts of DHA are also present in cell membranes throughout the body. AA and DHA have different and specific roles in neural and behavioral functions. DHA is crucial for the function of rhodopsin for vision and post- synaptic receptors for neurotransmission.

Fish, sea foods and micro algae provide long chain n-3 fatty acids such as DHA and EPA. These are biologically more active than short-chain alpha-linolenic (n-3) fatty acid present in plant foods. These long chain n-3 fatty acids are important for vision and brain growth and development during fetal life.

MUFA: MUFA decreases clot formation and atherogenesis.

Saturated Fatty Acids : SFA are known to increase serum total and LDL-cholesterol levels, increase inflammation, reduce insulin sensitivity and enhance the tendency of clot formation (thrombogenicity) and increase the risk of heart attack and stroke.

Cholesterol (lipid from animal source): Cholesterol plays an important role in the body cell membrane's fluidity and permeability. Cholesterol is also a precursor of many hormones and vitamin D. Cholesterol aids in cell signalling function and hormone activity. It is actively synthesized in the liver whenever required.

High density lipoproteins (HDL) remove and transport excess cholesterol from the tissues to the liver for degradation, and are therefore, anti-atherogenic. However, high blood levels of LDL cholesterol result in accumulation of lipids in the cells and causes atherogenic effect. A healthy diet (balanced diet) and physical activity improve HDL and decrease LDL.

Trans fatty acids (TFA): TFAs are fats that are produced during hydrogenation of vegetable cooking oils (example, vanaspati). TFA consumption alters lipid profile (dyslipidemia), endothelial dysfunction, decreases insulin sensitivity and increases risk of diabetes, breast cancer, colon cancer, preeclampsia, disorders of nervous system and vision in infants. Hence, one must avoid processed foods or bakery foods containing TFA.

- Fats, also called lipids, promote absorption of fat-soluble vitamins (A, D, E and K).
- In addition to important functions, fats contribute to energy, texture, flavor, taste and increase the palatability of the diet and impart a feeling of fullness and satisfaction and thus delay the onset of hunger.
- Fats increase the energy density of food as each gram of lipid gives energy of 9 Kcal, while

protein or carbohydrates give only 4 Kcal for every gram.

Dietary fats also contain minor components such as tocopherols, tocotrienols, sterols, etc. The natural flavor of fats/oils is largely due to these minor components. Since, most of the minor components are antioxidants, they prevent fats from going rancid. Tocotrienols in palm oil, lignans in sesame oil and oryzanol and tocotrienols in rice bran oil reduce blood cholesterol. Refining of oils, though does not alter their fatty acid composition. It modifies the composition of minor components; for example, crude palm oil is extracted from the pulp of the fruit of oil palms. The color of the pulp is red as it is rich in beta carotene (precursor of vitamin A). These carotenes are lost during refining of crude palm oil.

What are the sources of fats?

Plant foods have no cholesterol and are fairly good sources of MUFAs and PUFAs. Some plant foods also have SFAs. In most cereals, millets, beans and pulses the fat content ranges between 1.5%–3%. In cereals, millets and most oilseeds, n-6 is the major PUFA. Pulses, beans, green leafy vegetables and oilseeds such as soyabean, rapeseed/mustard, flax seeds, perilla and fenugreek seeds are good sources of both n-6 and n-3 PUFAs. Animal foods such as butter, ghee, whole milk, cream, fatty cheese and fatty meats are sources of cholesterol and SFAs along with some quantities of MUFAs and PUFAs. Egg has cholesterol but is a good source of n-6 and n-3. Marine fish is a good source of LC n-3 PUFA. Oil seeds, nuts, fenugreek seeds, beans, cereals, millets, leafy vegetables, if consumed adequately, can meet the requirements of both n3 and n6 essential fatty acids.

- Omega-6 is commonly found in most foods, while n-3 is available in walnuts, flax seeds, chia seeds, soyabean, fenugreek seeds, mustard and leafy vegetables
- Marine fish, other sea foods and eggs are good natural sources of long chain PUFAs (DHA, DPA, EPA).

Fats/oils that are used for cooking (vegetable oils, vanaspati, butter and ghee) or added to foods at the time of consumption/ dressing, are termed as 'visible' fats. Fats that are present as integral components of various foods (such as nuts, seeds, pulses, cereals and millets) are referred to as 'invisible' fats. Cereals contain only 2%–3% of invisible fat, however, their contribution to overall fat intake is significant as they contribute to bulk of our Indian diets. Most animal foods provide high amounts of saturated fat; hence it is advisable to choose lean cut meats.

How much visible fats do we need?

If one consumes adequate amounts of nuts, oilseeds, pulses and beans, the required amounts of 6.6g of n-6 PUFA and 2.2g of n-3 PUFA are easily met for all the essential functions in the body; and hence, there is no need for visible fats. However, today's dietary patterns and consumption habits are such that almost all recipes are made with visible fats. Therefore, visible fats cannot be avoided, but can be limited. The visible fat (cooking oil) must be limited to 20–50g (4–10 teaspoon full) per person/day depending on the level of energy (calorie) requirement, which is based on physical activity and physiological status. (For example, not more than 27–30g visible fat/cooking oil is required for a 2000 Kcal diet/day).

It is recommended that adult women or men with sedentary lifestyle limit daily fat intake to 20g and 30g of visible fat, respectively. Adult men with moderate and heavy physical activity may consume visible fat up to 40g and 50g respectively, while adult women with moderate and heavy physical activity may consume up to 30g and 40g respectively. During pregnancy and lactation, intake of oil seeds, nuts, beans and fish consumption must be encouraged to meet the daily needs of the higher fat and EFA requirement of fetus and infants. During these periods, visible fat should be restricted, while TFA should be avoided.

Does processing alter the quality of oils?

In general, all extracted seed (vegetable) oils must be used in moderation as extraction procedures (whether crude or refined) may contain undesirable substances. Crude vegetable oils are likely to contain several undesirable compounds, hence, the crude oil is subjected to a series of 'refining process' (using chemicals) to remove these undesirable compounds so that vegetable oils are suitable for human consumption. 'Refining' also removes the odor and extends the shelf life of vegetable oils. During the refining process, small amounts of minor components such as antioxidants, phytosterols etc. are also removed without altering the fatty acid composition. Processing or refining of extracted oils removes undesirable compounds found in crude extracted oils, but the refining process adds several additives including preservatives that are not good and hence, must be taken in moderate amounts.

'Crude vegetable oils' are the vegetable oils extracted from seeds (sunflower, soyabean, mustard, sesame, etc.) or fruits like palm and olive by mechanical expelling. Crude vegetable oils are likely to contain several undesirable compounds such as free fatty acids, gums, waxes, mono and diacylglycerides, phospholipids, hydrocarbons, pesticide residues, aflatoxins and allergens.

'Virgin oils' are produced by mechanical procedures, (expeller pressing) and the application of heat. However, virgin oils also contain undesirable compounds (details above), similar to crude oil. Nutrients such as antioxidants and phytonutrients are preserved, since use of mechanical procedures does not alter the nature of the oil.

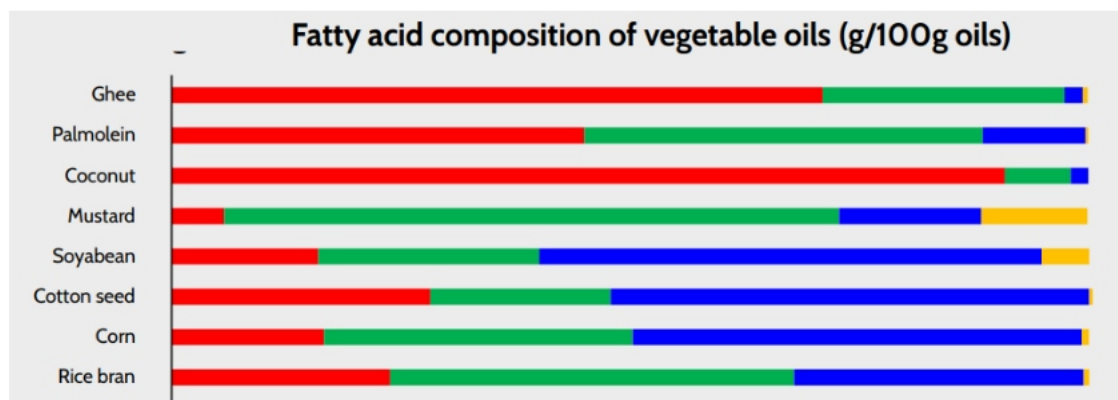
'Cold pressed oils' (Kachi ghani tel), also contain undesirable compounds, similar to crude oil. However, nutrients such as antioxidants and phytonutrients are preserved as they are obtained without altering the nature of the oil by mechanical procedures, (expeller pressing), without the application of heat.

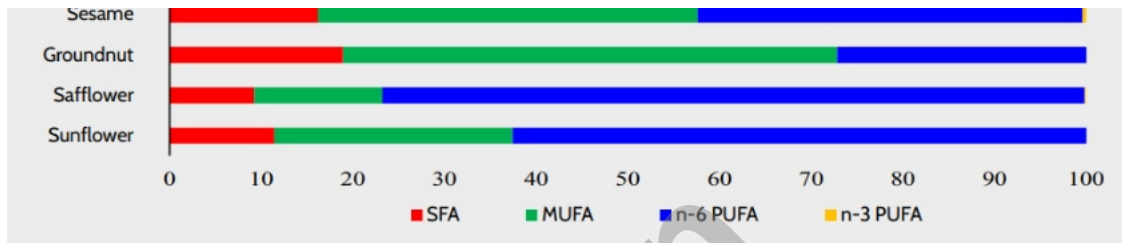
What about hydrogenated fat?

Hydrogenated fat is prepared by partial hydrogenation of vegetable oils (often referred to as 'vegetable shortening'). During hydrogenation, the liquid oils become solid because MUFA and PUFA are converted into SFA and isomers called trans fatty acids. Vanaspathi is used as a substitute for ghee/butter in cooking and the preparation of sweets, snack foods and bakery products. Current evidence indicates that intake of trans-fatty acids can increase the risk of heart disease and stroke and are more harmful than SFA.

Repeated heating of oils

The practice of 'reusing' vegetable oils for cooking, (which have been repeatedly heated during food preparations) is very common, both at homes and in commercial establishments. Repeated heating of vegetable oils/fat, results in oxidation of PUFA, leading to the generation of compounds which are harmful /toxic and may increase the risk of cardiovascular diseases and cancer. At household level, vegetable oil once used for frying, should be filtered and may be used for curry preparation but using the same oil for frying again should be avoided. Also, such oils should be consumed in a day or two. Storing 'used' oils for a long time should be avoided, as the rate of deterioration is high in such oils.





To view more details of the guidelines, [click here](#).

Source: [National Institute of Nutrition, Hyderabad](#)

Source: https://data.vikaspedia.in/short/lc?k=z-ZWuIZ_RhzQWSIXLZD1yw

