

FATS AND OILS

Ques. - Why do we need fats in our diet?

Ans. Cooking oils (liquid) and solid fats together are referred to as fats. Fats contribute to texture, flavour and taste and increase the palatability of the diet. Fats are essential for meeting some of the nutritional needs like essential fatty acids (linoleic n-6 and -linolenic n-3) and serve as rich sources of energy. Therefore, fats should be consumed, in moderation. However, for the growth of young children high caloric diets are required. This is achieved by inclusion of adequate amounts of fat (1gm fat = 9Kcals) in their diets as they cannot consume large quantities of bulky cereal pulse based diets.

Fats also promote the absorption of the four fat-soluble vitamins (A, D, E and K), impart a feeling of fullness and satisfaction and thus, delay the onset of hunger. Along with proteins, fats constitute major components of body fluids and cell membranes. The two essential fatty acids namely, linoleic (n-6) and -linolenic acid (n-3) (important dietary polyunsaturated fatty acids) are metabolized at various sites in the body to generate a group of biologically-active compounds, which perform several important physiological functions.

Ques. - What are the sources of fat?

Ans. Dietary fats can be derived from both plant and animal sources.

Fats can be classified as:

Visible fat: Fats that are used as such at the table or during cooking (vegetable oils, vanaspati, butter and ghee) are termed as “visible” fats.

Invisible fat: Fats that are present as integral components of various foods are referred to as “invisible” fat.

Hidden fat: Fats, in processed and ready to eat foods are known as hidden 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. The small amounts of invisible fat present in various foods add up to a substantial level in our daily diet (about 15 g in rural population and 30g among urban middle-income and high-income groups). Most animal foods provide high amounts of invisible fat.

Ques. – How much visible fat do we need?

Ans. The total fat (visible + invisible) in the diet should provide between 15-30% of total calories.

The visible fat intake in the diets can go upto 50g/person/day based on the level of physical activity and physiological status.

Adults with sedentary lifestyle should consume about 25 g of visible fat, while individuals involved in hard physical work require 30g to 40g of visible fat.

Visible fat intake should be increased during pregnancy and lactation to 30g. The higher fat and EFA requirements during pregnancy and lactation are to meet the requirements of foetus and young infants, in view of their crucial role in physical and neuronal growth and development.

Diets of young children and adolescents should contain about 30-40g/day. However, ingestion of too much fat is not conducive to good health.

Ques. - What are the chemical components of fat?

Ans. A. Fatty acids: All fats in foods provide mixtures of three types of fatty acids, which are the “building blocks” of fats. Fatty acids are the primary constituents of all dietary fats. Based on their chemical nature, the fatty acids are broadly grouped as:

1. Saturated Fatty acids

Fats from coconut oil, *vanaspati*, animal fats (ghee and butter) and animal foods like milk, milk products and meat provide saturated fatty acids. The short and medium chain saturated fatty acids present in ghee, butter and coconut oil are easily digested and absorbed and are therefore, good for infants and young children. However, high intake of saturated fatty acids increases atherogenic risk and their intake should be limited in adults.

2. Monounsaturated Fatty acids

Oils from sources such as palm, groundnut, cottonseed, sesame and olive are rich in monounsaturated fatty acids as compared to other oils.

3. Polyunsaturated Fatty acids

Linoleic (n-6) and -linolenic (n-3) acids are the simple PUFA which are present only in plant foods. All vegetable oils (except coconut) are good sources of linoleic (n-6) acid.

Soyabean, rapeseed and mustard oils are the only vegetable oils which contribute significant proportion of alpha-linolenic (n-3) acid.

Legumes/pulses mustard and fenugreek seeds and green leafy vegetables are also good sources of -linolenic (n-3) acid.

On the other hand, fish and fish oils provide long chain n-3 fatty acids which are biologically more -active than -linolenic (n-3) acid present in plant foods.

Tocotrienols in palm oil, lignans in sesame oil and oryzanol and tocotrienols in rice-bran oil reduce blood cholesterol.

B. Cholesterol is present only in foods of animal origin such as milk, meat, shrimp and prawn, but not in plant foods. Egg yolk and organ meats such as liver, kidney and brain contain very high amounts of cholesterol. Cholesterol is found in all body cells and plays a key role in the formation of brain, nerve tissue and is a pre-cursor for some hormones and vitamin D. It is synthesized in the body and hence it is not an essential dietary component and therefore it should not be included in the diet deliberately.

MAJOR FATTY ACIDS IN FATS AND OIL

SATURATED	MONOUNSATURATED	POLYUNSATURATED	
Coconut Palm kernel Ghee/butter Vanaspati	Red palm oil Palmolein Groundnut Ricebran Sesame	LINOLEIC (n-6)	ω-3 LINOLENIC (n-3)
		Low	Red palm oil Palmolein Rapeseed, Mustard Soyabean
		Moderate	Groundnut, Ricebran Sesame
		High	Safflower, Sunflower Cottonseed, Corn, Soyabean

Quantities of foods required to furnish 0.1 g ALA

Food	Amount (g)
Cereal/Millet Wheat & Pearl millet (bajra)	70
Pulses Blackgram (kala chana), Kidney Beans (rajmah) & cowpea (lobia) Other pulses	20 60
Vegetables Green leafy Other Vegetables	60 400
Fruits	400
Spices Fenugreek seed (methi) Mustard (sarson)	5 1
Unconventional Flaxseed (alsi) Perilla seeds (Bhanjira)	0.5 0.3

Higher dietary cholesterol increases blood cholesterol. The blood cholesterol elevating effect of dietary saturated fats increases, when cholesterol consumption is high. Therefore, cholesterol intake should be maintained below 200 mg/day. One can reduce both saturated fat and cholesterol intake by limiting the consumption of high-fat animal foods like butter, ghee, meat, egg and organ meats and consuming low fat (skimmed) milk instead of whole milk (full cream milk). However, consumption of eggs (3eggs/ week) is recommended in view of several nutritional advantages.

Ques. - What are the physiological/health implications of Saturated Fatty Acids?

Ans. Saturated fatty acids are known to increase serum total and LDL (Low Density Lipoprotein) cholesterol levels, reduce insulin sensitivity and enhance thrombogenicity and increase CVD (Cardiovascular Disease) risk. Therefore, SFA intake should not exceed 8-10% of total energy.

Milk consumption should be encouraged as it provides calcium for bone health. However consumption of butter and cheese should be limited.

Ques. - What are the physiological/health implications of Polyunsaturated Fatty Acids (PUFAs)?

Ans. PUFAs are essential components of cell membranes. While n-6 PUFAs are predominant in all cells, the nerve tissue has high levels of long chain n-3 PUFA. An appropriate balance of these two classes of PUFAs; namely, Linoleic and alpha-linolenic acids in the diets is essential for the functioning of vascular, immune, nervous and renal systems and for early human development.

Further, PUFAs reduce total and HDL cholesterol influence peripheral glucose utilization, insulin action and decrease adiposity and hence are anti-atherogenic. The lipid lowering and other physiological effects of individual members of the PUFAs vary widely.

As compared to linoleic acid, **alpha**-linolenic (n-3) acid is more beneficial for prevention of inflammation and accumulation of fatty material in blood vessels (atherosclerosis) and clotting of blood (thrombosis). The long chain n-3 PUFA of fish oils have greater antiatherogenic, antithrombotic and anti-inflammatory effects than -linolenic (n-3) acid of plant foods. It is important to consume more ALA and long chain n-3 PUFA.

The intake of PUFA should be 8-10% of energy intake. The remaining 8-10% of fat calories can be derived from mono-unsaturated fatty acids, which also help in maintaining plasma cholesterol. Excessive use of highly unsaturated fats should be avoided. Further, to get a good proportion of all the classes of fatty acids, it is advisable to consume more than one type of vegetable oils.

Fats/ lipids (triglycerides, cholesterol and phospholipids) are transported in blood in combination with proteins in the form of lipoproteins. The low density lipoproteins (LDL) transport cholesterol from liver to various tissues. High blood levels of LDL cholesterol ('bad' cholesterol) result in accumulation of lipids in the cells (atherogenic effect). High density lipoproteins (HDL) ('good' cholesterol) scavenge excess cholesterol from the tissues to the liver for degradation, and are therefore, anti-atherogenic.

Ques. – What are the ideal combination of cooking oils necessary for good health?

Ans. No single oil can fulfil the requirements of essential fatty acids and hence a combination of various oils has been suggested. In view of the above, an ideal quality fat for good health is one which maintains a balance so as to give a ratio of polyunsaturated/saturated (PUFA/SFA) of 0.8- 1.0, and linoleic/ -linolenic (n-6/n-3) of 5-10 in the total diet.

For ensuring this appropriate balance of fatty acids in cereal-based diets, it is necessary to increase the α -linolenic acid intake and reduce the quantity of linoleic acid obtained from the cooking oil. Hence, the choice of cooking oil should be as follows:

Groundnut/Seasame/Rice bran + Mustard	Safflower/Sunflower + Palmolein/ Olive
Groundnut/Seasame/Rice bran + Canola	Safflower/Sunflower + Groundnut/Seasame/Rice bran
Groundnut/Seasame/Rice bran + Soyabean	
Palmolein + Soyabean	
Safflower/Sunflower + Palmolein + Mustard	

Ques. – What are the other advantages of using more than one variety of vegetable oil?

Ans. Use of more than one source of fat/oil has the added advantage of providing a variety of minor components in the diet. An additional way of increasing α -linolenic (n-3) acid intake is to ensure regular consumption of foods rich in α -linolenic (n-3) acid like Rapeseed, Mustard, Soybean oil etc

Non-vegetarians have an advantage of eating fish, which provides pre-formed long chain n-3 PUFA. Ideally, part of visible fat and/or invisible fat from animal foods may be substituted by whole nuts and legumes with good proportion of α -linolenic (n-3) acid, which are also good sources of protein, fibre, vitamins and Minerals.

The plant oils in addition contain certain useful substances such as lignans (sesame oil), sterols, tocopherols (vitamin E) oryzanole (rice bran oil), carotenoids - all of which reduce cholesterol and repair oxidant damage due to ageing, inflammation which occur in chronic diseases.

Ques. – What are the health implications of consuming vanaspati oil?

Ans. Vanaspati is prepared by hydrogenation of vegetable oils. During hydrogenation, the liquid oils become solid because the mono and polyunsaturated fatty acids are converted, into saturated fatty acids and isomers called trans-fatty acids.

Vanaspati is used as a substitute for ghee as a cooking medium and in the preparation of bakery products, sweets and savoury snacks. Since saturated fats are resistant to oxidation, foods prepared in vanaspati keep fresh for a longer period. Current evidence indicates that saturated fatty acids and a high intake of trans-fatty acids may increase the risk of heart disease. Therefore, it is essential to limit the intake of vanaspati. The intake of trans-fatty acids should not exceed 2% of energy intake.

Ques. – What are the important points to be kept in mind regarding fats and oils?

Ans.

- Take just enough fat.
- Substitute part of visible fat and invisible fat from animal foods with whole nuts.
- Moderate the use of animal foods containing high fat, SFA and cholesterol.

- Limit use of ghee, butter and vanaspati as a cooking oil.
- Choose low fat dairy foods in place of regular whole fat.
- Eat foods rich in alpha-linolenic (n-3) acid legumes, green leafy vegetables, fenugreek and mustard seeds.
- Eat fish more frequently (at least 100-200g fish/week prefer it over meat and poultry and limit/avoid organ meats (liver, kidney, brain etc)).
- Egg has several important nutrients but high in cholesterol. Limit the consumption to 3 eggs/week. However, egg white may be consumed in good amounts.
- Minimize consumption of premixed ready- to- eat fast foods, bakery foods and processed foods prepared in hydrogenated fat.
- Use of re-heated fats and oils should be avoided.
- Consume variety of foods and maintain moderation to get good proportions of all fatty acids and derive optimal health benefits.