

# UNSATURATED FATTY ACIDS

Fatty Acids are aliphatic carboxylic acid with varying hydrocarbon lengths at one end of the chain joined to terminal carboxyl (-COOH) group at the other end. The general formula is  $R-(CH_2)_n-COOH$ . Fatty acids are predominantly unbranched and those with even numbers of carbon atoms between 12 and 22 carbons long react with glycerol to form lipids (fat-soluble components of living cells) in plants, animals, and microorganisms. Fatty acids all have common names respectively like lauric (C12), Myristic (C14), palmitic (C16), stearic (C18), oleic (C18, unsaturated), and linoleic (C18, polyunsaturated) acids. The saturated fatty acids have no double bonds, while oleic acid is an unsaturated fatty acid has one double bond (also described as olefinic) and polyunsaturated fatty acids like linolenic acid contain two or more double bonds. Lauric acid (also called Dodecanoic acid) is the main acid in coconut oil (45 - 50 percent) and palm kernel oil (45 - 55 percent). Nutmeg butter is rich in myristic acid (also called Tetradecanoic acid ) which constitutes 60-75 percent of the fatty-acid content. Palmitic acid(also called Hexadecylic acid ) constitutes between 20 and 30 percent of most animal fats and is also an important constituent of most vegetable fats (35 - 45 percent of palm oil). Saturated carboxylic acids (C1 – C10) are liquids whereas long chain saturated fatty acids are solids. The long carbon chains form compact pile in a regular pattern with high van der waals attractions resulting in high melting points. If double bonds are present in the fatty acid portion of the molecule, the fat is said to be unsaturated. Monounsaturated contains only one double bond; polyunsaturated contains more than one double bonds (up to an maximum of about six) which are never conjugated and can form geometric cis/trans isomers. Naturally occurring unsaturated fatty acids are liquids as they are in the cis-geometrical configuration which twists molecular structure (the kink of the cis- form); can not pack closely, lowers melting points. Unsaturated fatty acids in the kinked, cis form are much more common in cells than the trans- form continues in the same direction without a pronounced kink. The cis form of unsaturated fatty acids are more fluid at biological temperatures and are more abundant in living organisms. Fatty acids are named by the number of carbon atoms n and the number of double bonds m as (n:m). The system for naming double bond position is to indicate the first double bond in the carbon backbone counting from the opposite end from the carboxyl group. The terminal carbon atom is called the omega carbon atom. The term "omega-3 or omega-6" signifies that their single double bond is occurred at carbon number 3 or 6 respectively counted from and including the omega carbon. Human bodies are not capable of synthesizing omega-3 and omega-6 fatty acids which are called essential fatty acids must be obtained through the diet. (These fatty acids were designated as "Vitamin F", until it was realized that they must be classified with the fats.) Fatty acids are converted to energy through the process called fatty acid oxidation in liver cells. Fatty acids are used as basic building blocks of biological membranes, for long-term energy storage (the major components of triglycerides) as well as for the precursors of eicosanoid hormones.

COMMON NAME	SYSTEMATIC NAME	CAS RN	SYMBOL
Myristolenic Acid	(Z)-9-Tetradecenoic Acid	544-64-9	14:1 n-5
Palmitoleic Acid	(Z)-9-Hexadecenoic Acid	373-49-9	16:1 n-7
Palmitelaidic Acid	(E)-9-Hexadecenoic Acid	10030-73-6	16:1 n-7 (trans)
Vaccenic Acid	(Z)-11-Octadecenoic Acid	506-17-2	18:1 n-7
Oleic Acid	(Z)-9-Octadecenoic Acid	112-80-1	18:1 n-9
Elaidic Acid	(E)-9-Octadecenoic Acid	112-79-8	18:1 n-9 (trans)
Linoelaidic Acid	(E,E)-9,12-Octadecadienoic Acid	506-21-8	18:2 n-6 (trans)
Linoleic Acid	(Z,Z)-9,12-Octadecadienoic Acid	60-33-3	18:2 n-6
Isolinoleic Acid	(E,E)-9,11-Octadecadienoic Acid	544-71-8	18:2 n-6 (trans)
Linolenic Acid	(Z,Z,Z)-9,12,15-Octadecatrienoic Acid	463-40-1	18:3 n-3
gamma-Linolenic Acid	(Z,Z,Z)-6,9,12-Octadecatrienoic Acid	506-26-3	18:3 n-6
Moroctic Acid	(Z,Z,Z,Z)-6,9,12,15-Octadecatetraenoic Acid	20290-75-9	18:4 n-3
Eicosenoic Acid	(Z)-11-Eicosenoic Acid	5561-99-9	20:1 n-9
Eicosadienoic Acid	(Z,Z)-11,14-Eicosadienoic Acid	2091-39-6	20:2 n-6
Mead Acid	(Z,Z,Z)-5,8,11-Eicosatrienoic Acid	20590-32-3	20:3 n-9
Eicosatrienoic Acid	(Z,Z,Z)-11,14,17-Eicosatrienoic Acid	17046-59-2	20:3 n-3
Dihomo-g-Linolenic Acid	(Z,Z,Z)-8,11,14-Eicosatrienoic Acid	1783-84-2	20:3 n-6

Omega-3 Arachidonic Acid	(Z,Z,Z,Z)-8,11,14,17-Eicosatetraenoic Acid	24880-40-8	20:4 n-3
Arachidonic Acid	(Z,Z,Z,Z)-5,8,11,14-Eicosatetraenoic Acid	506-32-1	20:4 n-6
Timnodonic Acid	(Z,Z,Z,Z,Z)-5,8,11,14,17-Eicosapentaenoic Acid	10417-94-4	20:5 n-3
Erucic Acid	(Z)-13-Docosenoic Acid	112-86-7	22:1 n-9
Docosadienoic Acid	(Z,Z)-13,16-Docosadienoic Acid	17735-98-7	22:2 n-6
Docosatrienoic Acid	(Z,Z,Z)-13,16,19-Docosatrienoic Acid	28845-86-5	22:3 n-3
Adrenic Acid	(Z,Z,Z,Z)-7,10-13-16-Ocosatetraenoic Acid	28874-58-0	22:4 n-6
Docosapentaenoic Acid	(Z,Z,Z,Z,Z)-4,7,10,13,16-Docosapentaenoic Acid	25182-74-5	22:5 n-6
Docosapentaenoic Acid	(Z,Z,Z,Z,Z)-7,10,13,16,19-Docosapentaenoic Acid	24880-45-3	22:5 n-3
Docosahexaenoic Acid	(Z,Z,Z,Z,Z,Z)-4,7,10,13,16,19-Docosahexaenoic Acid	6217-54-5	22:6 n-3
Nervonic Acid	(Z)-15-Tetracosanoic Acid	506-37-6	24:1 n-9
Tetracosahexaenoic Acid	((Z,Z,Z,Z,Z,Z)-6,9,12,15,18,21-Tetracosahexaenoic Acid		24:6 n-3