Editorial
Volume 11:5, 2022

Vitamins & Minerals

ISSN: 2376-1318

Open Access

An Overview of Fatty Acids

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Editorial

A fatty acid is an aliphatic carboxylic acid having a saturated or unsaturated chain that is used in chemistry, notably in biochemistry. The majority of fatty acids that are found in nature contain an unbranched chain with an even number of carbon atoms, ranging from 4 to 28. In some species, as microalgae, fatty acids make up a significant portion of the lipids (up to 70% by weight), but in other creatures, they are present as one of the three main groups of esters: triglycerides, phospholipids, and cholesteryl esters. Fatty acids are crucial dietary sources of energy for animals and crucial cellular building blocks in any of these forms [1].

There are numerous ways to categorise fatty acids, including length, saturation *vs.* unsaturation, even *vs.* odd carbon content, and linear *vs.* branched. Fatty acids with aliphatic tails of five or fewer carbons are known as short-chain fatty acids (SCFA) (e.g. butyric acid). Medium-chain fatty acids (MCFA) are fatty acids that can produce medium-chain triglycerides and have aliphatic tails of 6 to 12 carbons. Aliphatic fatty acids with tails containing 13 to 21 carbons are known as long-chain fatty acids (LCFA). Fatty acids having aliphatic tails of 22 or more carbons are referred to as very long chain fatty acids (VLCFA). Primary Article Saturated lipid Check out List of saturated fatty acids for a longer list. No C=C double bonds exist in saturated fatty acids. With differences in "n," they have the same formula CH3 (CH2) nCOOH. Stearic acid (n = 16), a significant saturated fatty acid, is neutralised with lye to produce soap, which is the most prevalent type of soap. One or more C=C double bonds can be found in unsaturated fatty acids. Both cis and trans isomers can be produced by the C=C double bonds.The two hydrogen atoms next to the double bond protrude on the same side of the chain in a cis form. In the case of the cis isomer, the hardness of the double bond causes the conformation to freeze, bends the chain, and limits the fatty acid's conformational freedom. The flexibility of a chain in the cis form decreases as the number of double bonds increases. A chain becomes quite bent in its most accessible conformations when it contains a lot of cis bonds. For instance, linoleic acid, which has two double bonds, has a more prominent bend than oleic acid, which has one double bond and a "kink" in it. With three double bonds, linolenic acid prefers a hooked form [2].

The effect of this is that, in restricted environments, such as when fatty acids are part of a phospholipid in a lipid bilayer or triglycerides in lipid droplets, cis bonds limit the ability of fatty acids to be closely packed, and therefore can affect the melting temperature of the membrane or of the fat. Cis unsaturated fatty acids, however, increase cellular membrane fluidity, whereas trans unsaturated fatty acids do not. In contrast, a trans configuration means that the two hydrogen atoms next to it are on the opposing sides of the chain. They resemble straight saturated fatty acids in form and as a result do not significantly bend the chain [3].

Each double bond has three (n-3), six (n-6), or nine (n-9) carbon atoms following it, and all double bonds in naturally occurring unsaturated fatty acids have a cis orientation. The majority of fatty acids with the trans configuration (trans fats) are artificial byproducts of processing rather than occurring naturally (e.g., hydrogenation). Additionally, certain trans fatty acids can be found in ruminant meat and milk (such as cattle and sheep). They are created in these animals' rumens by fermentation. They can also be found in the breast milk of women who consumed them, as they are also present in dairy products made from ruminant milk. The building of biological structures and biological processes depend heavily on the geometric differences between saturated and unsaturated fatty acids as well as between different types of unsaturated fatty acids (such as cell membranes) [4].

The majority of fatty acids have an even number of carbon atoms in their chains, for example, stearic (C18) and oleic (C18). Odd-chained fatty acids are those fatty acids that have odd numbers of carbon atoms (OCFA). The most prevalent OCFAs are the dairy-derived saturated C15 and C17 derivatives, pentadecanoic acid and heptadecanoic acid, respectively. OCFAs are slightly biosynthesized and metabolised differently from their even-chained cousins at the molecular level [5].

Conflict of Interest

None.

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How to cite this article: Gluud, Moyer. "An Overview of Fatty Acids." J Vitam Miner 11 (2022): 198.

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Date of Submission: 02 May 2022, Manuscript No. VTE-22-72720; **Editor assigned:** 04 May 2022, Pre QC No. P-72720; **Reviewed:** 09 May 2022, QC No. Q-72720; **Revised:** 14 May 2022, Manuscript No. R-72720; **Published:** 19 May 2022, DOI: 10.37421/2376-1318.2022.11.198