

Bio202(2)

By Tabih Fatima

All About Biotech

Email: vuallaboutbiotechofficial@gmail.com

Give a detailed account of Fatty Acids.

800 words At least.

ANSWER:

Fatty acid

It is a Chemical compound. Fatty acid, important component of lipids (fat-soluble components of living cells) in plants, animals, and microorganisms.

Classification

Depending on their degree of saturation/unsaturation in the carbon chain, they can be divided into three classes:

Saturated fatty acids (SFAs), if no double bond is present;

Monounsaturated fatty acids (MUFAs), if only one double bond is present;

Polyunsaturated fatty acids (PUFAs), if two or more double bonds are present.

Moreover on the basis of the absence/presence of double/triple bonds they can be grouped into two broad classes:

Saturated FAs, if there are no double bonds in the carbon chain;

Unsaturated FAs, if there are one or more double bonds in the carbon chain.

On the basis of the ability or not to synthesize them de novo from endogenous precursors by animals, and whose deficiency can be reversed by dietary addition, they can be classified as:

Essential fatty acids

Not essential

Finally, depending only on chain length they can be functionally divided into:

Short chain FAs (SCFAs): up to 6 carbon atoms;

Medium chain FAs (MCFAs): from 8 to 12 carbon atoms;

Long chain FAs (LCFAs): from 14 to 18 carbon atoms;

Very long chain FAs (VLCFAs): from 20 carbon atoms onwards.

Fatty Acid Classifications

Short chain saturated fatty acids, thanks to their high water solubility, short chain length and small molecular size, are rapidly absorbed in the intestine and are transported, bound to albumin, to the liver by the portal vein, not requiring chylomicrons formation.

The pathway of absorption and transport of MCFAs is similar.

LCFAs and VLCFAs have a low or absent water solubility and hence, after intestinal absorption, are secreted into lymphatic system as component of chylomicrons, and by the thoracic duct are transferred into the circulatory system at the subclavian vein level (venous blood).

Other classes of fatty acids

- Oxygenated fatty acids

They contain hydroxyl, keto, and epoxy groups; an example is ricinoleic acid, the major fatty acid in castor oil.

- Cyclic fatty acids

They contain a cyclic unit with three, five, like prostaglandins, or even six carbon atoms.

Generally, a fatty acid consists of a straight chain of an even number of carbon atoms, with hydrogen atoms along the length of the chain and at one end of the chain and a carboxyl group (—COOH) at the other end. It is that carboxyl group that makes it an acid (carboxylic acid). If the carbon-to-carbon bonds are all single, the acid is saturated; if any of the bonds is double or triple, the acid is unsaturated and is more reactive. A few fatty acids have branched chains; others contain ring. Among the most widely distributed fatty acids are the 16- and 18-carbon fatty acids, otherwise known as palmitic acid and stearic acid, respectively. Both palmitic and stearic acids occur in the lipids of the majority of organisms. In animals palmitic acid makes up as much as 30 percent of body fat. It accounts for anywhere from 5 to 50 percent of lipids in vegetable fats, being especially abundant in palm oil. Stearic acid is abundant in some vegetable oils (e.g., cocoa butter and shea butter) and makes up a relatively high proportion of the lipids found in ruminant tallow. (e.g., prostaglandins).

They are rarely free in nature and are the main components of: triacylglycerols (or triglycerides);

- Diacylglycerols
- monoacylglycerols (the last two families of compounds are often added to prostaglandin)
- Phospholipids of cell membranes
- Sterol esters.

Fatty acids are not found in a free state in nature; commonly they exist in combination with glycerol (an alcohol) in the form of triglyceride.

Many animals cannot synthesize linoleic acid (an omega-6 fatty acid) and alpha-linolenic acid (an omega-3 fatty acid). Those fatty acids are required, however, for cellular processes and the production of other necessary omega-3 and omega-6 fatty acids. Thus, because they must be taken in through the diet, they are called essential fatty acids. Omega-6 and omega-3 fatty acids derived from linoleic acid and alpha-linolenic acid, respectively, are needed conditionally by many mammals—they are formed in the body from their parent fatty acids but not always at levels needed to maintain optimal health or development. Human infants, for example, are thought to have a conditionally essential need for docosahexaenoic acid (DHA), which is derived from alpha-linolenic acid, and possibly also for arachidonic acid, which is derived from linoleic acid.

Fatty acids have a wide range of commercial applications. For example, they are used not only in the production of numerous food products but also in soaps, detergents, and cosmetics. Soaps are the sodium and potassium salts of fatty acids. Some skin-care products contain fatty acids, which can help maintain healthy skin appearance and function. Fatty acids, particularly omega-3 fatty acids, are also commonly sold as dietary supplements.

