Classification and structure of lipids

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Last update: Saturday, 17 Dec 2022 at 8.46 pm.

This article has been translated from WikiSkripta; ready for the **editor's review**.

Lipids, a group of chemically and functionally heterogeneous substances, have in common insolubility in water - hydrophobicity, excellent solubility in non-polar solvents and the presence of alcohols and fatty acids in the molecule. They are often synthesized in the body from acetyl-CoA.

Fatty acids usually mean **higher monocarboxylic acids'**. They contain approximately 8 or more carbon atoms, with typically an even number of carbon atoms (because they are formed from acetyl-CoA). If they contain double bonds, they are usually isolated and in the ``cis *configuration. Acids with length* C_{16} *and* C_{18} *are predominant.*

Classification of lipids

Simple lipids

- Acylglycerols
- Waxes

Compound lipids

- Phospholipids
  - Glycerophospholipids
  - Sphingolipids
- Glycolipids
  - Cerebrosides
- Gangliosides
- Lipoproteins

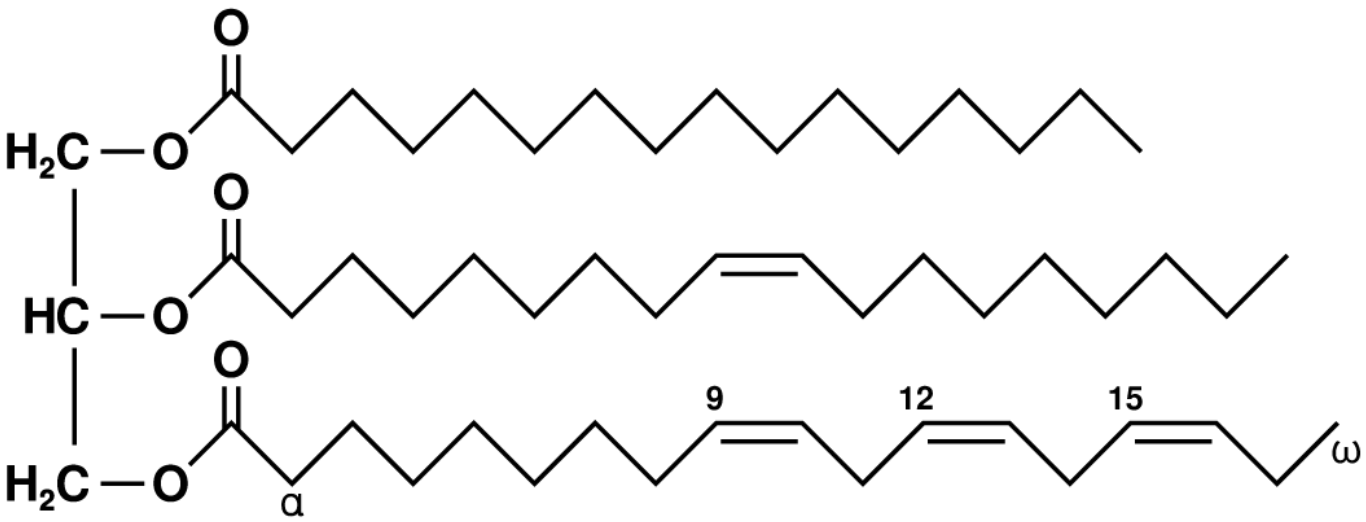
Simple lipids

File:Sphingolipid Structure.png
Sphingolipid Structure

Simple lipids are esters of fatty acids and alcohols. They are made up only of a '*hydrophobic part*.

Acylglycerols

Acylglycerols (glycerides) are esters of higher fatty acids and glycerol. According to the number of fatty acid molecules bound to alcohol, they are divided into mono-, di- or triacylglycerols. Triacylglycerols are of greatest importance to us, which are part of *fats* - a mixture of solid triacylglycerols, or of *oils* - a mixture of liquid triacylglycerols.



Acidic hydrolysis of acylglycerols produces the corresponding fatty acids and glycerol.

By *alkaline hydrolysis*, saponification, glycerol and a mixture of fatty acid salts - *soap* are produced.

Waxes

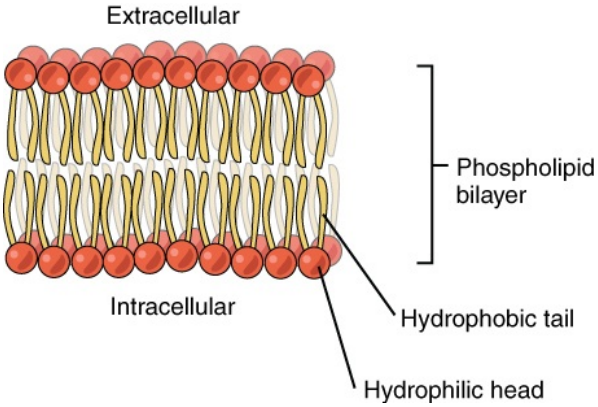
Waxes are esters of higher fatty acids and higher monohydric alcohols. An example is ``cetyl alcohol *with sixteen carbon atoms,* ``*ceryl alcohol* with twenty six carbon atoms, or ``myricyl alcohol *with thirty carbon atoms.*

Complex lipids

Complex lipids form the basic building block cell membranes. We include phospholipids, glycolipids and lipoproteins. In addition to the hydrophobic part, complex lipids also contain hydrophilic components. They are therefore referred to as **polar lipids** and form micelles and bilayers.

Phospholipids

Phospholipids contain a residue of phosphoric acid H_3PO_4 in their molecule. Phospholipids include glycerol phospholipids and sphingophospholipids.

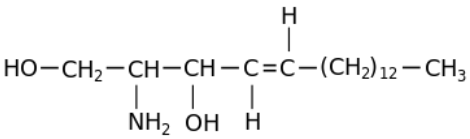


Glycerolphospholipids (phosphoacylglycerols)

The basis of glycerol phospholipids is the ``phosphatidic acid *molecule, which consists of glycerol esterified with two molecules of fatty acids and one molecule of H_3PO_4. Another component can be attached to the phosphate group of phosphatidic acid, e.g. choline, serine, ethanolamine, etc. The most numerous group of glycerol phospholipids are ``phosphatidylcholines* (lecithins) and are used as part of biological membranes.

Glycerophospholipids also include phosphatidylethanolamines (kephalins), phosphatidylserines and phosphatidylinositols.

Sphingophospholipids



Sphingophospholipids contain the alcohol *sphingosine* to which other components bind.

- Sphingosine with an attached fatty acid is called '*ceramide*.
- The most important subgroup are **sphingomyelins** formed by ceramide with a bound phosphoric acid residue and choline. Sphingomyelins are found, for example, in nervous tissue.

Glycolipids

Glycolipids contain one or more monosaccharides. These monosaccharides are glycosidically bound to the lipid part of the mono- or diacylglycerol or sphingosine molecule. Glycolipids include cerebrosides and gangliosides.

- '*Cerebrosides* ***are formed by a molecule of ceramide with bound galactose. They occur mainly in the white matter of the CNS. H_2SO_4 can bind to cerebrosides, then we call them*** *sulfatides*.
- **Gangliosides** are formed by ceramide to which an oligosaccharide, usually galactose and glucose, is attached. They are found in the ganglia of nerve cells and the gray matter of the CNS.

Lipoproteins

Lipoproteins are made up of a combination of lipids and proteins.

🔎 *For more information see [[1] (http://fblt.cz/skripta/ii-premena-latek-a-energie-v-bunce/140-2/)].*

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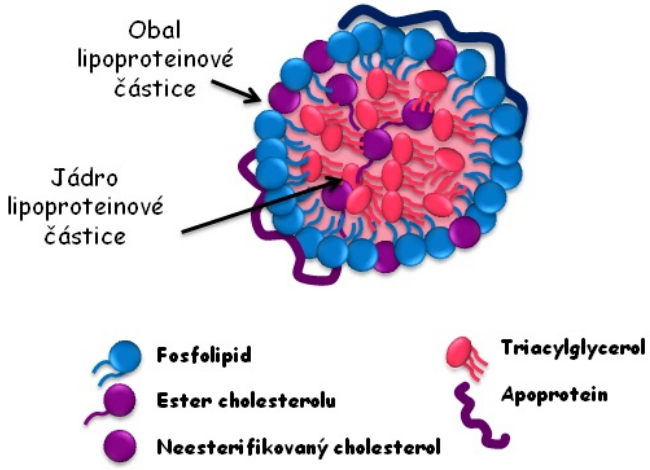
Obal
lipoproteinové
částice
Jádro
lipoproteinové
částice
Fosfolipid
Ester cholesterolu
Neesterifikovaný cholesterol
Triacylglycerol
Apoprotein