

Lipids (1. LF UK, NT)

They are natural non-polar compounds that are insoluble in water, but are soluble in non-polar solvents.

Importance of lipids

- they are one of the basic components of food, they serve as a source and reserve of energy (38kJ/g)
- structural function - they are part of biomembranes (eg: double layer of phospholipids -> form micelles)
- protective function - they cover some organs and thus protect them from shock
- thermal insulation
- solvents of non-polar vitamins (A, D, E, K)
- precursors

Divisions

Simple

they contain only the lipid part

- acylglycerols - are esters of VMK and glycerol (fats and oils)

- triacylglycerols are the most abundant in the human diet

- waxes (animal, vegetable)

Composite

obsahují lipidovou a nelipidovou část

- they contain a lipid and a non-lipid part
- glycoacylglycerols - contain a carbohydrate component

- are part of plant membranes

- phosphoacylglycerols - are part of biological membranes and lipoproteins

- their molecule is amphipathic

- sphingolipids - their basis is a compound that contains the 18-carbon amino alcohol sphingosine

- they are further divided into sphingomyelins containing ceramide and choline, these include cerebrosides and gangliosides containing carbohydrate and sialic acid - they are amphipathic and are found in the brain and nerves

Derived

- terpenes
- steroids

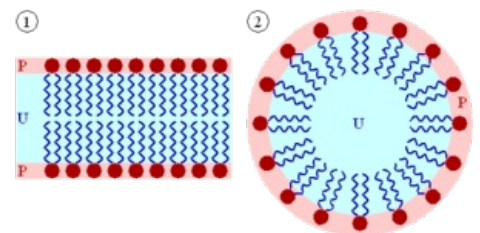
Higher fatty acids

They are the basic component of lipids. They have a high number of C, a high number of non-polar bonds and only one functional group - COOH, which is polar. They are unbranched, have a hydrophobic character and a cis arrangement that is natural in nature and our body can break it down.

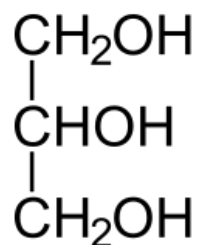
Glycerol

=propane-1,2,3-triol, glycerin

It is a sweet viscous liquid, infinitely miscible with water.



Bilayer of phospholipids and micelle



Glycerol

Source of dietary fat

extraction of crude fats and oils, sources

- **vegetable** - pressing, extraction
- **animal** - smelting, extraction

Vegetable fats and oils

Refining

- slime removal (hydration), vegetable slimes, proteins, their complexes - lecithin
- deacidification (neutralization) - acid salts
- whitening - carotenoids, chlorophylls
- deodorization - tocopherols, sterols

Classification

By consistency

- oils (liquid)
 - drying - linen
 - semi-drying - sunflower/soybean
 - non-drying - olive
- fats (plastic, mushy) - lard
- waxes (hard, non-greasy) - beeswax

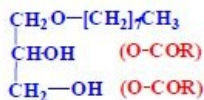
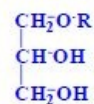
By structure

1. fatty acids and their soaps $R-[CH_2]_n-COOH$
2. homolipids (esters of fatty acids with alcohols)

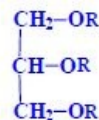
1. monohydric alcohols (waxes)

- aliphatic (cerides)
 - $CH_3-[CH_2]_{25}-OH...$ ceryl alcohol (beeswax)
 - $H_3-[CH_2]_{15}-OH...$ hexadecan-1-ol, cetyl alcohol (cetaceum)
- alicyclic (steroids) - esters of sterols (cholesterol), triterpene alcohols

2. dihydric alcohols (glycols), Alkoxylipids: 1-Alkoxypropane-2,3-diols Chimyl alcohol



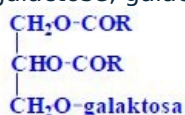
3. trihydric (glycerol)



fats and oils

4. polyhydric alcohols:

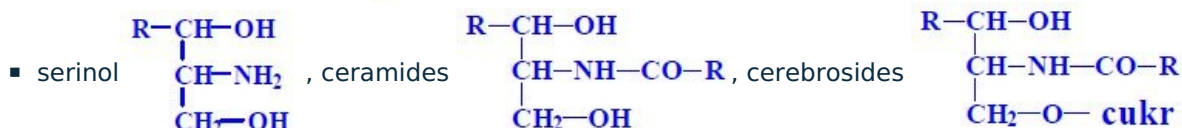
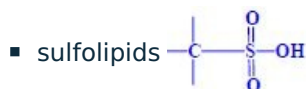
- sugars - glycolipids
 - galactose, galactosides, digalactosides, diacylglycerogalactoside (diacylgalactosylglycerol)



- sacrose (1-3 MK emulsifiers, 6-8 MK low-energy fats (OLESTRA))
- sorbitol (sugar alcohols) emulsifiers

3. heterolipids 0.5-2%

- glycerol, MK, another component



4. complex lipids

- proteolipids (lipoproteins)

- glycolipids (cerebrosides)
- mucolipids (sialoglycosphingolipids = gangliosides)

Links

Related articles

- Fatty acid
- Lipid breakdown and metabolism of ketone bodies

References

- ws:Lipidy (1. LF UK, NT)
- Maxdorf. *Velký lékařský slovník* [online]. [cit. 2016-11-09]. <<http://lekarske.slovníky.cz/pojem/sfingolipidy>>.
- JANATOVÁ, Markéta. *Metabolismus lipidů a steroidů* [online]. [cit. 2016-11-09]. <<https://el.lf1.cuni.cz/p6dp3dd8fm5/?account-id=7&principal-id=8587330&session=breezfn9563te4p3zv6i4>>.
- DAVÍDEK, Jiří. 3. *LIPIDY* [online]. [cit. 2012-03-11]. <<https://el.lf1.cuni.cz/p60846053/>>.