



HME103-Principles of Nutrition

Components in foods and their relationship with health: Fatty acids

Lesson Code: HME103-Principles of Nutrition

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Essential fatty acids

Fatty acids containing two or more double bonds are very important physiologically. These oils have essential properties.

They cannot be synthesized within the body and must be obtained externally through food.

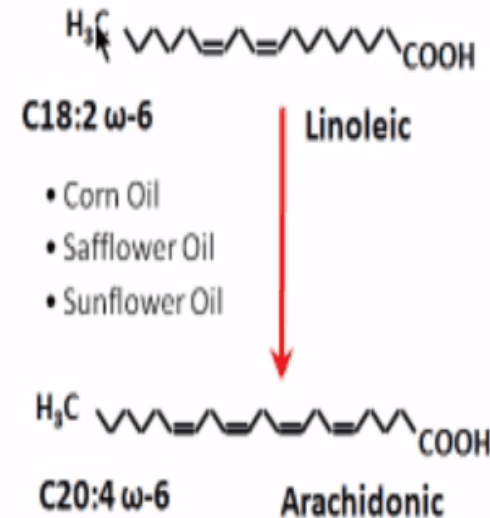
Essential fatty acids are used in the formation of compounds called prostaglandins.

*Prostaglandins are lipid components derived enzymatically from fatty acids that have important functions in the animal body.

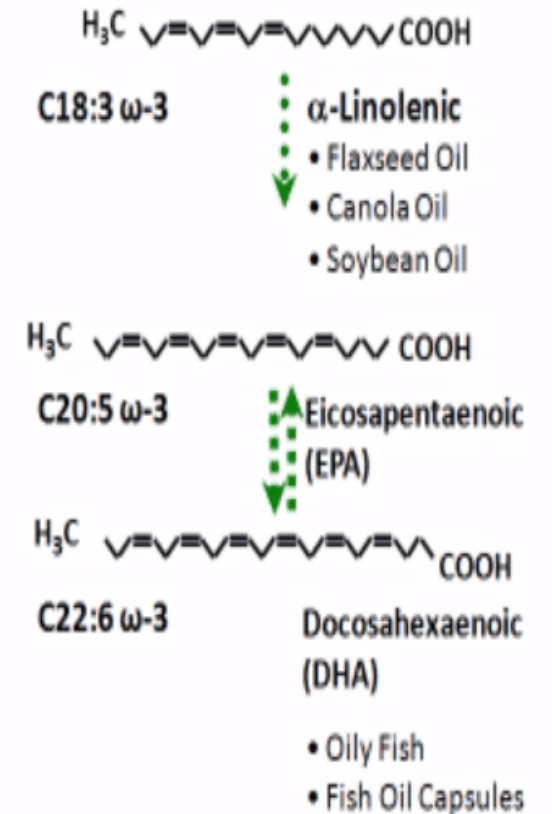
Prostaglandins control blood pressure, hemostasis, blood lipid levels, immunity, and inflammatory responses due to infection.

Essential Fatty Acid Families

ω -6 family



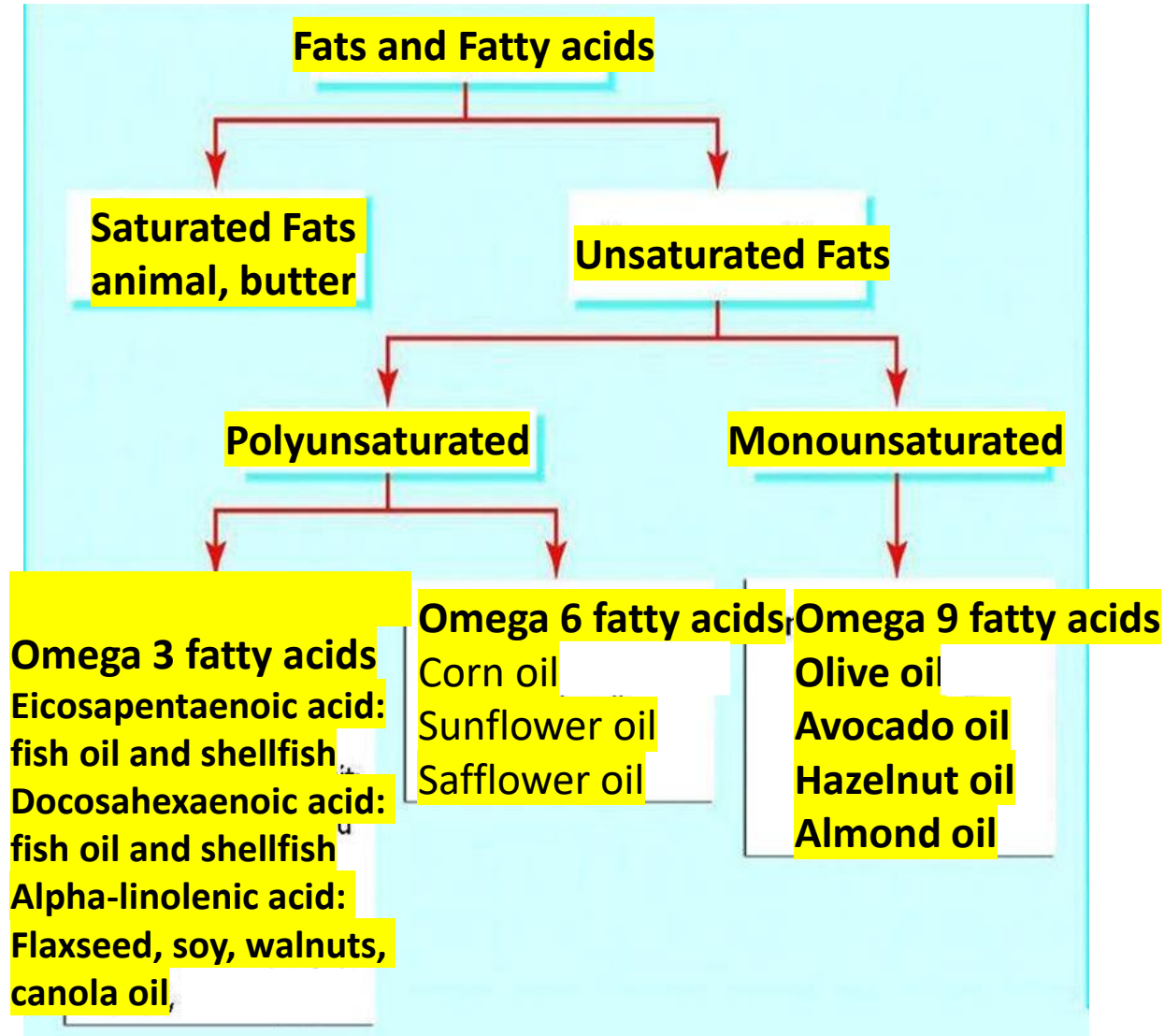
ω -3 family



ω -3 and ω -6 fatty acids are called essential fatty acids because they are not synthesized in the human body.

Apart from seafood, **omega-3** fatty acids are abundant in vegetable oils such as hazelnuts, walnuts, sesame, flaxseed, soybeans, canola and olive oil.

Omega-6 fatty acids are found in high amounts in corn, soy, cotton and sunflower oil.

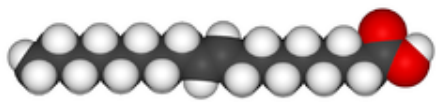
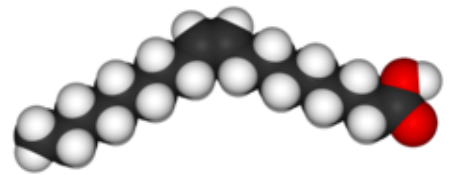
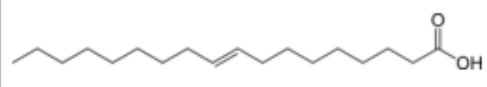
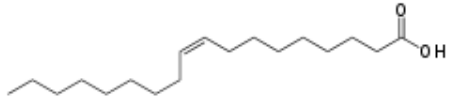


Symptoms of essential fatty acid deficiency

- Weakness, fatigue
- Problems in skin and mucosa
- Weakening of memory and mental functions
- Weakening of visual function
- Increased tendency to clot
- Weakening of immune functions
- Increase in triglyceride and cholesterol levels
- Growth retardation in infants and children
- Hair loss
- Infertility in men
- Increase in blood pressure
- Slowed wound healing
- Depression

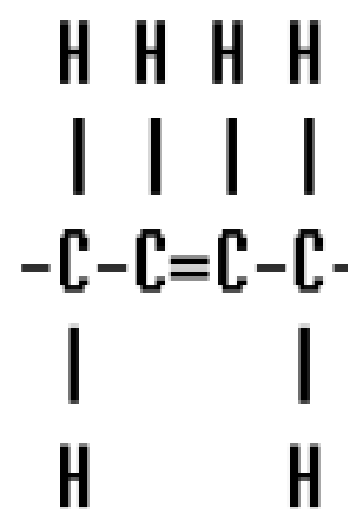
Cis-Trans Fatty Acids

- The double bond can show two configurations as trans and cis.
- Only unsaturated fats can be either trans or cis; because only double bonds can bond to these orientations.
- Saturated fats are never called trans fats because they do not contain double bonds.
- In the trans configuration, the carbon chain extends from opposite sides of the double bond, creating a flatter molecule.
- In the cis configuration, the carbon chain extends from the same side of the double bond, creating a bent molecule.

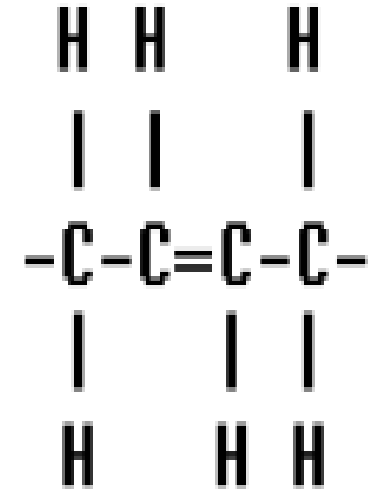
Trans (Elaidic acid)	Cis (Oleic acid)
Elaidic acid is the main trans unsaturated fatty acid encountered in hydrogenated vegetable oils.	Oleic acid is a cis unsaturated fatty acid that makes up 55-80% of olive oil.
	
	
These fatty acids are geometric isomers (they are structurally conjugated except for the bonding of double bonds)	

Cis-Trans Fatty Acids

- Trans fats can be formed naturally by bacteria in the rumen of ruminant animals (such as sheep, lamb, and cow).
- Trans fatty acids can be formed by heating oils at very high temperatures. It may occur as a result of frying oils or using them repeatedly.
- It can also be formed by partial hydrogenation of vegetable oils.



cis



trans

Cis-Trans Fatty Acids

Consumption of trans-fatty acids increases the risk of coronary heart disease by increasing artery-clogging low-density lipoprotein (bad cholesterol, LDL). It also causes a decrease in the level of high-density lipoprotein (good cholesterol, HDL), which is anti-atherogenic or cardioprotective.

