



Structure, health, cooking with...

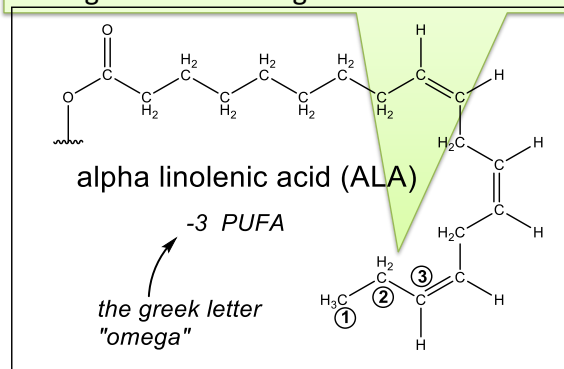
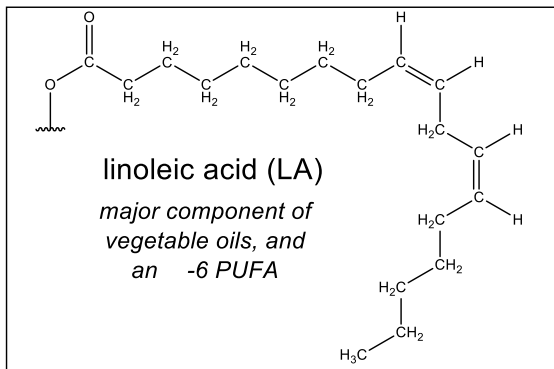
## BALANCING FATS



### Some fats are essential

The human body cannot make polyunsaturated fats (PUFAs) – so we *must* get them from our diet.

Considering that “omega” is the very end of the Greek alphabet. What might the name “omega-3” be referring to?



Two of the most important fats for human health are linoleic acid and alpha linolenic acid – these “acids” are fatty acids that have been incorporated into plant *triglycerides*

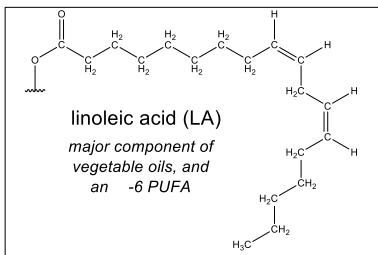
Omega-6 fats are abundantly available in common plant oil such as vegetable oil and olive oil. Omega-3 fats are harder to come by...they are abundant in flaxseed oil, and also in fish oil!



## Balancing the fats

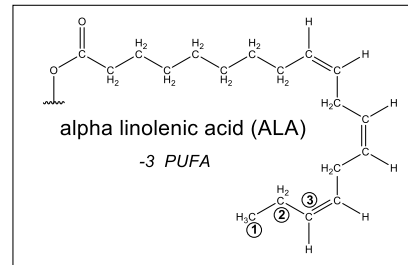
*PUFAs are essential.* The omega-6 LA and omega-3 ALA are precursors to many important signaling molecules in the human body

Produces **Pro-inflammatory** signaling molecules



A molecular messenger in which the molecule is specifically involved in transmitting information between cells of a multicellular organism

Produces **Anti-inflammatory** signaling molecules



The same set of enzymes convert both LA and ALA.

Conversion of LA and ALA to signaling molecules requires many enzymes



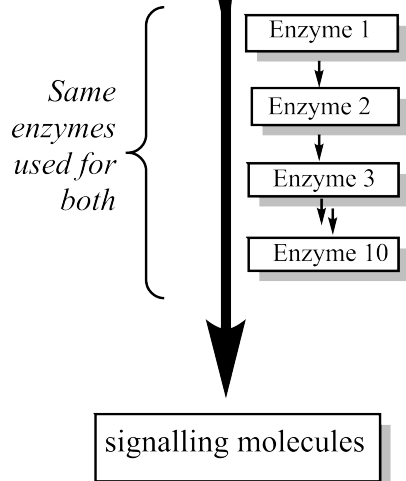
## Balancing the fats

Omega-6 fats are readily available in the Western diet. They are found in Corn, soybean and olive oils

LA ( $\omega$ -6)

ALA ( $\omega$ -3)

Omega-3 fats are not as typical in the Western diet. They are found in fish and flaxseed oils

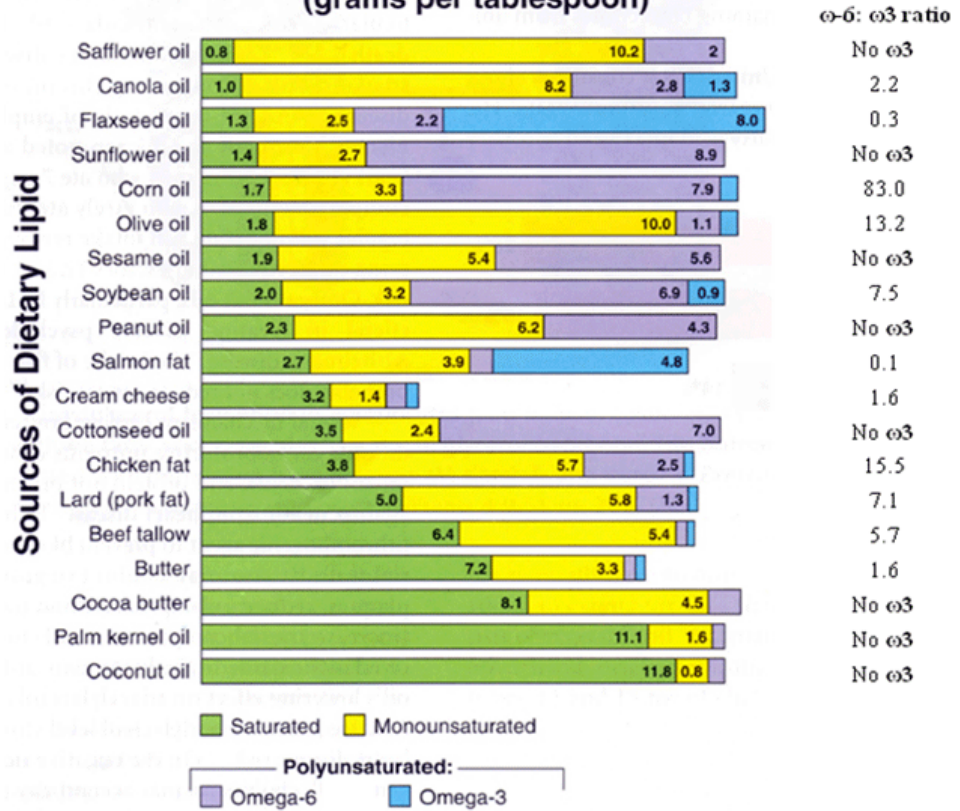


PUFAs (LA and ALA) can only be made inside plants (only plants have the necessary enzymes to make these molecules), but animals (like fish!) can contain high concentrations of PUFAs if the animal's diet is made of PUFA containing plants.



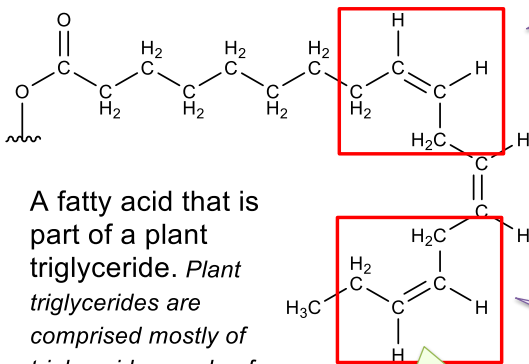


## Fatty Acid Content (grams per tablespoon)



## Fat Stability

**cis** double bonds are more likely to react with the oxygen in the air (undergoing oxidation) either *trans* double bonds or all single bonds



A fatty acid that is part of a plant triglyceride. *Plant triglycerides are comprised mostly of triglycerides made of cis polyunsaturated fatty acids.*

**Oxidation** of cis double bonds breaks the long chains into shorter chains to yield stinky and unpleasant tasting products—this process turns the fat/oil **rancid**.

oxygen from the air → rancid fats (yuck!)

In fact, PUFAs like the **omega-3's** are so unstable that they have short shelf lives and do not withstand the heat of cooking.

Why are omega-3 containing oils more unstable and prone to oxidation (from oxygen in the air) when compared to omega-6 oils?