FATTY ACIDS

Hydrocarbon chain,
4-28 C atoms
ending with a carboxylic group
even numbers in nature
(saturated or unsaturated)

CH_3-$(CH_2)_n$-COOH

Fatty acids are classified based on their chain length, Parameter driving their blood/tissues destination/distribution:

- Short chain*:* < 6 C atoms
- Medium chain*:* 6 -12 C atoms
- Long chain 13 – 21 C atoms
- Very long > 22

Carbon atoms N°	structure	Common name	IUPAC	Notation Abbrev.	T fusion (°C)	In Nature
4	$CH_3(CH_2)_2COOH$	Butyric	Butanoic	C4:0	-5	
6	$CH_3(CH_2)_4COOH$	Caproic	hexanoic	C6:0	-2	Milk and coconut oil
8	$CH_3(CH_2)_6COOH$	Caprylic	Octanoic	C8:0	17	Milk and coconut oil
10	$CH_3(CH_2)_8COOH$	Capric	Decanoic	C10:0	32	Milk and coconut oil Elm seeds (50% of total fatty ac.)
12	$CH_3(CH_2)_{10}COOH$	**Lauric**	Dodecanoic	C12:0	44	Laurus plant/seeds & coconut oil
14	$CH_3(CH_2)_{12}COOH$	**Myristic**	Tetradecanoic	C14:0	58	All vegetable oils
16	$CH_3(CH_2)_{14}COOH$	**Palmitic**	Hexadecanoic	C16:0	62	**All animal fat & vegetable fat & lard**
18	$CH_3(CH_2)_{16}COOH$	**Stearic**	Octadecanoic	C18:0	72	**All animal fat & vegetable fat & lard**
20	$CH_3(CH_2)_{18}COOH$	Arachidic	Heicosanoic	C22:0	78	**All animal fat & vegetable & lard**

Table 8.1

Common Biological Fatty Acids

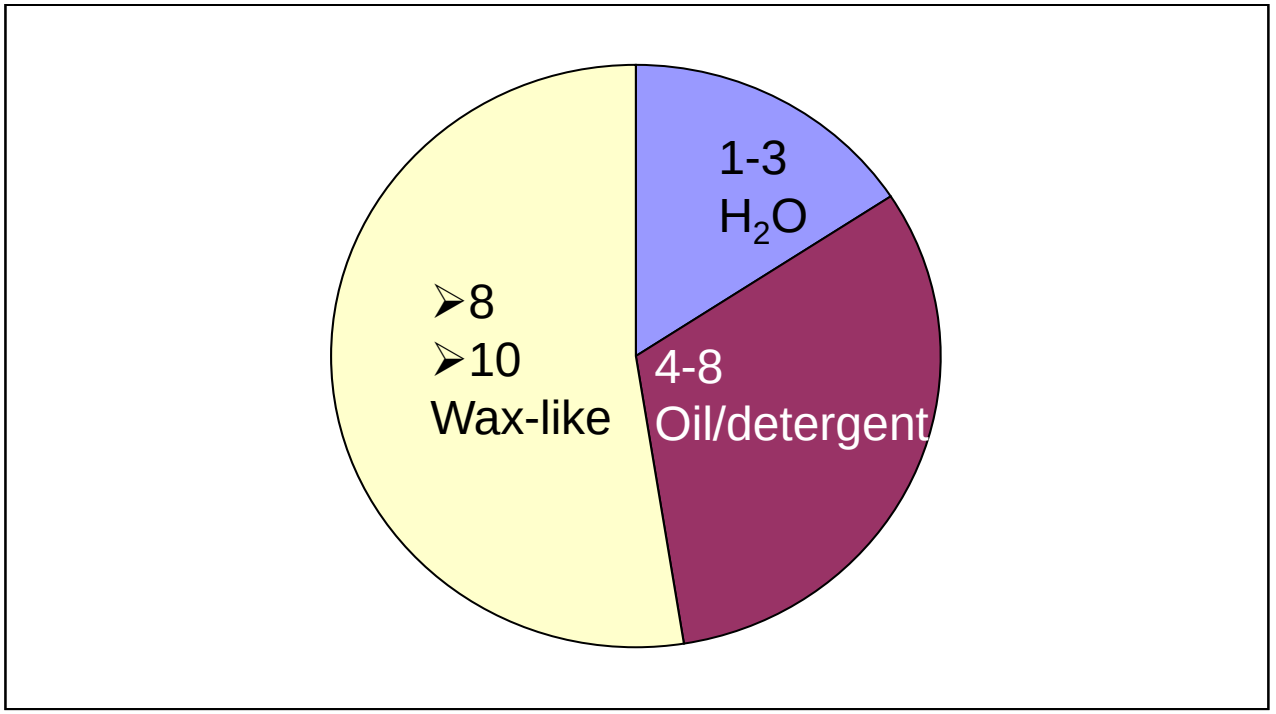
Number of Carbons	Common Name	Systematic Name	Symbol	Structure
Saturated fatty acids				
12	Lauric acid	Dodecanoic acid	12:0	$CH_3(CH_2)_{10}COOH$
14	Myristic acid	Tetradecanoic acid	14:0	$CH_3(CH_2)_{12}COOH$
16	Palmitic acid	Hexadecanoic acid	16:0	$CH_3(CH_2)_{14}COOH$
18	Stearic acid	Octadecanoic acid	18:0	$CH_3(CH_2)_{16}COOH$
20	Arachidic acid	Eicosanoic acid	20:0	$CH_3(CH_2)_{18}COOH$
22	Behenic acid	Docosanoic acid	22:0	$CH_3(CH_2)_{20}COOH$
24	Lignoceric acid	Tetracosanoic acid	24:0	$CH_3(CH_2)_{22}COOH$
Unsaturated fatty acids (all double bonds are *cis*)				
16	Palmitoleic acid	9-Hexadecenoic acid	16:1	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COOH$
18	Oleic acid	9-Octadecenoic acid	18:1	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COOH$
18	Linoleic acid	9,12 -Octadecadienoic acid	18:2	$CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COOH$
18	α-Linolenic acid	9,12,15 -Octadecatrienoic acid	18:3	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COOH$
18	γ-Linolenic acid	6,9,12 -Octadecatrienoic acid	18:3	$CH_3(CH_2)_4(CH{=}CHCH_2)_3(CH_2)_3COOH$
20	Arachidonic acid	5,8,11,14 -Eicosatetraenoic acid	20:4	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COOH$
24	Nervonic acid	15-Tetracosenoic acid	24:1	$CH_3(CH_2)_7CH{=}CH(CH_2)_{13}COOH$

Fatty acids and food

Fatty Acid Compositions of Some Dietary Lipids*					
Source	**Lauric and Myristic C 14**	**Palmitic C 16**	**Stearic C 18**	**Oleic C 18 : 1**	**Linoleic C 18: 2**
Beef	**5**	**24-32**	**20-25**	**37-43**	**2-3**
Milk		**25**	**12**	**33**	**3**
Coconut	**74**	**10**	**2**	**7**	**-**
Corn		**8-12**	**3-4**	**19-49**	**34-62**
Olive		**9**	**2**	**84**	**4**
Palm		**39**	**4**	**40**	**8**
Safflower		**6**	**3**	**13**	**78**
Soybean		**9**	**6**	**20**	**52**
Sunflower		**6**	**1**	**21**	**66**

*Values are percentages of total fatty acids.

Solubility & n° of C atoms

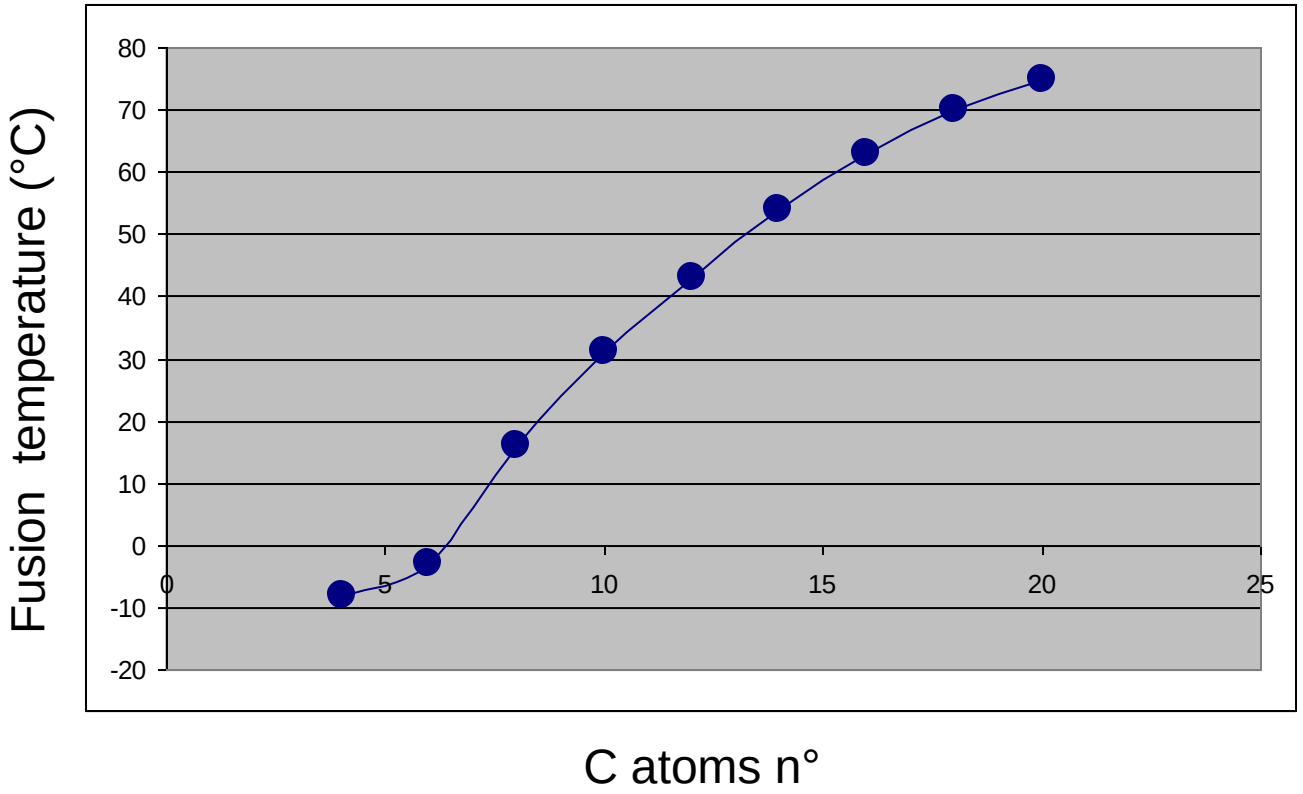


Myristic acid nutmeg

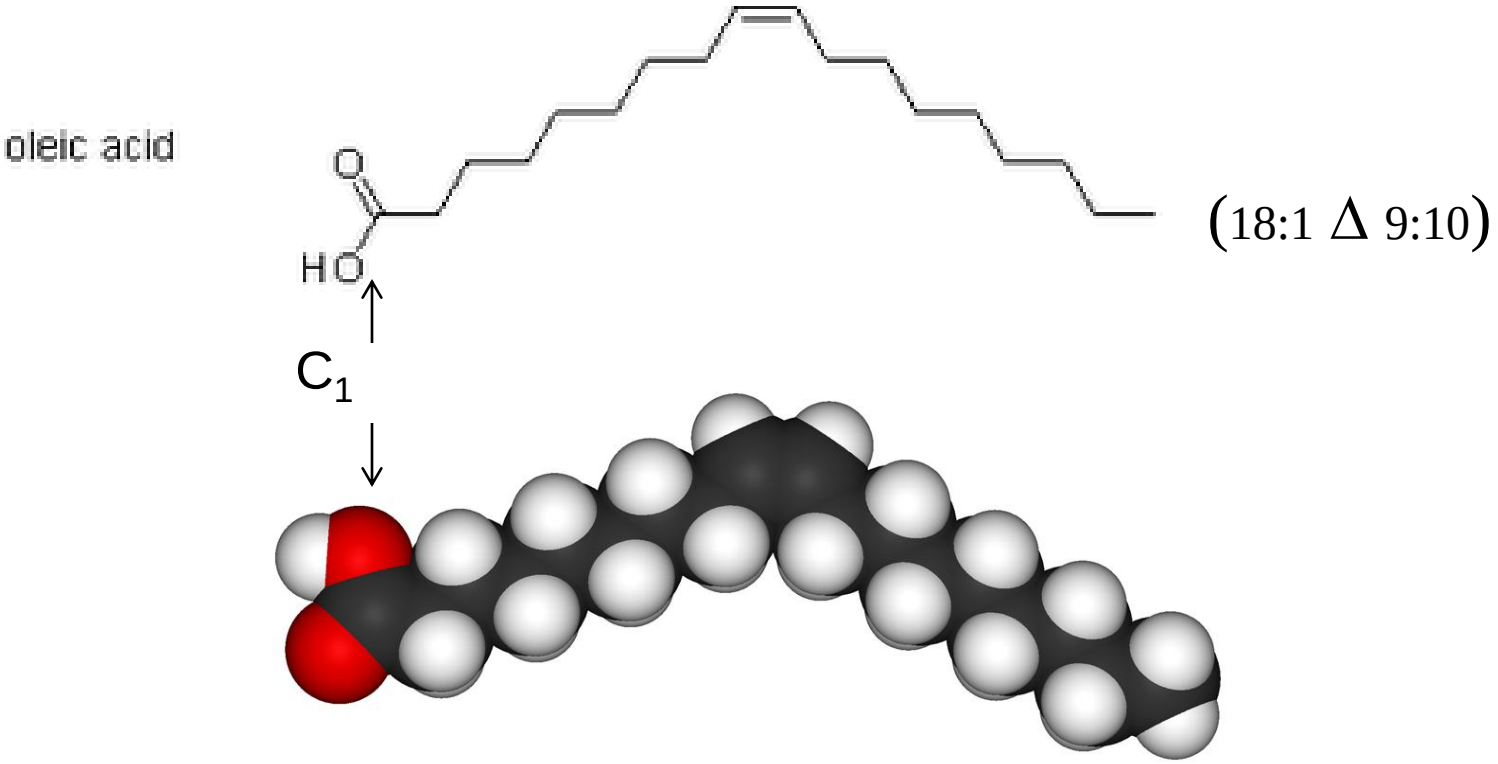
Myristica fragrans

Myristic ac. (14:0)

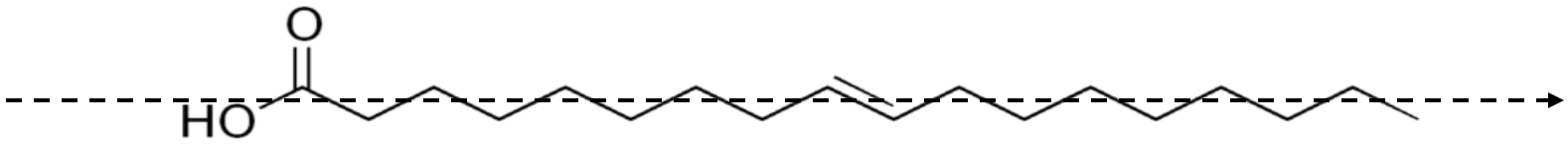
Fusion point
Saturated mono-carboxylic
Different chain length



Unsaturated fatty acids

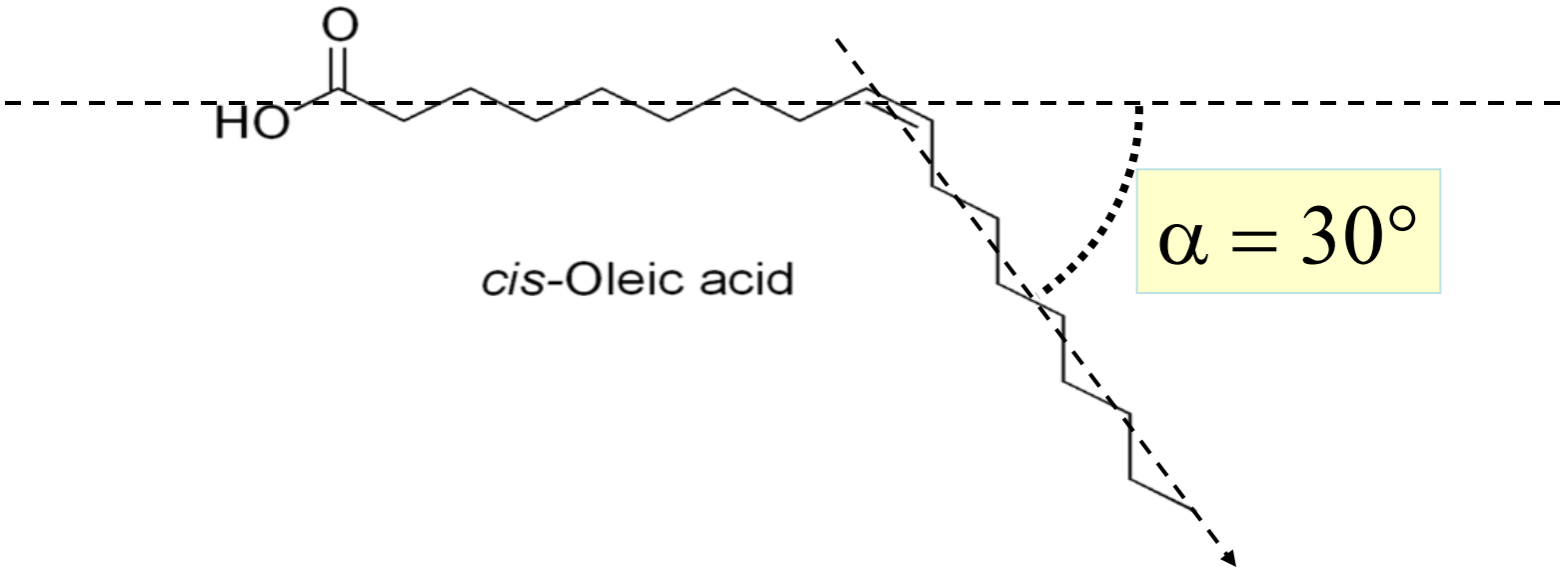


cis / trans
steric hindrance



trans-Oleic acid

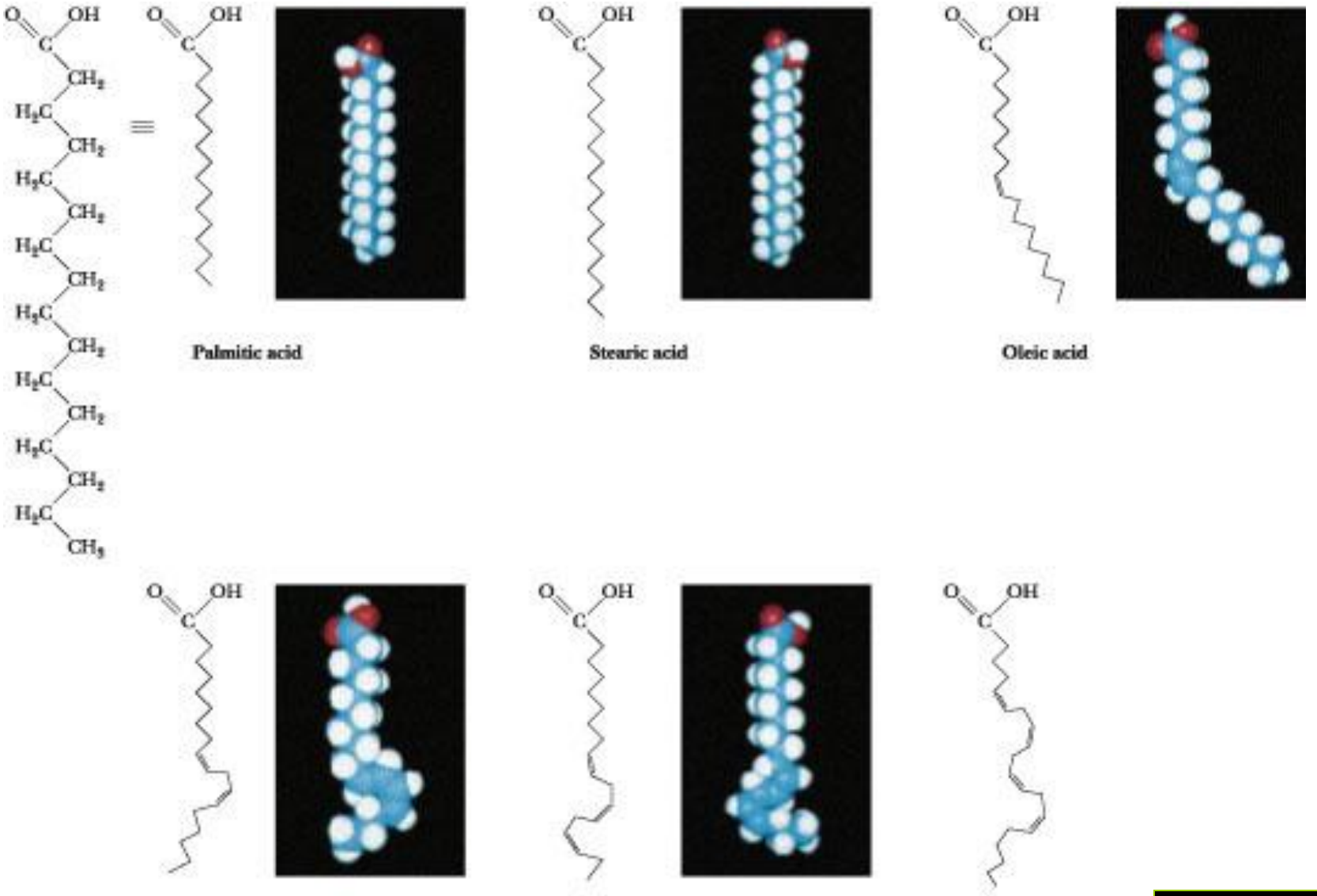
(C, 18:1 Δ 9:10)



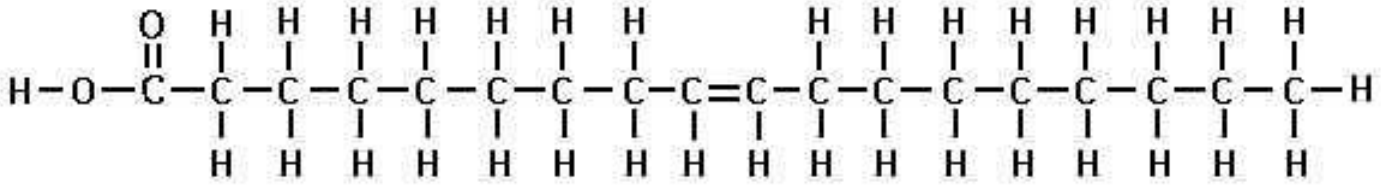
cis-Oleic acid

$\alpha = 30°$

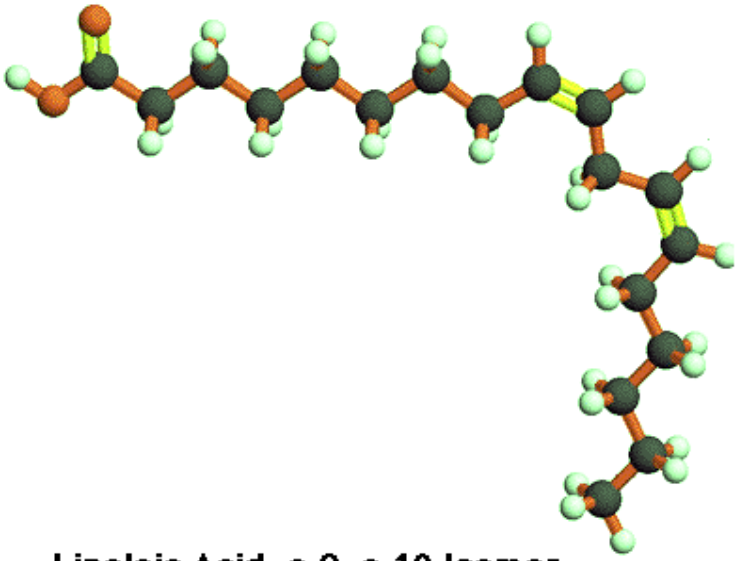
Double bond(s) & structure



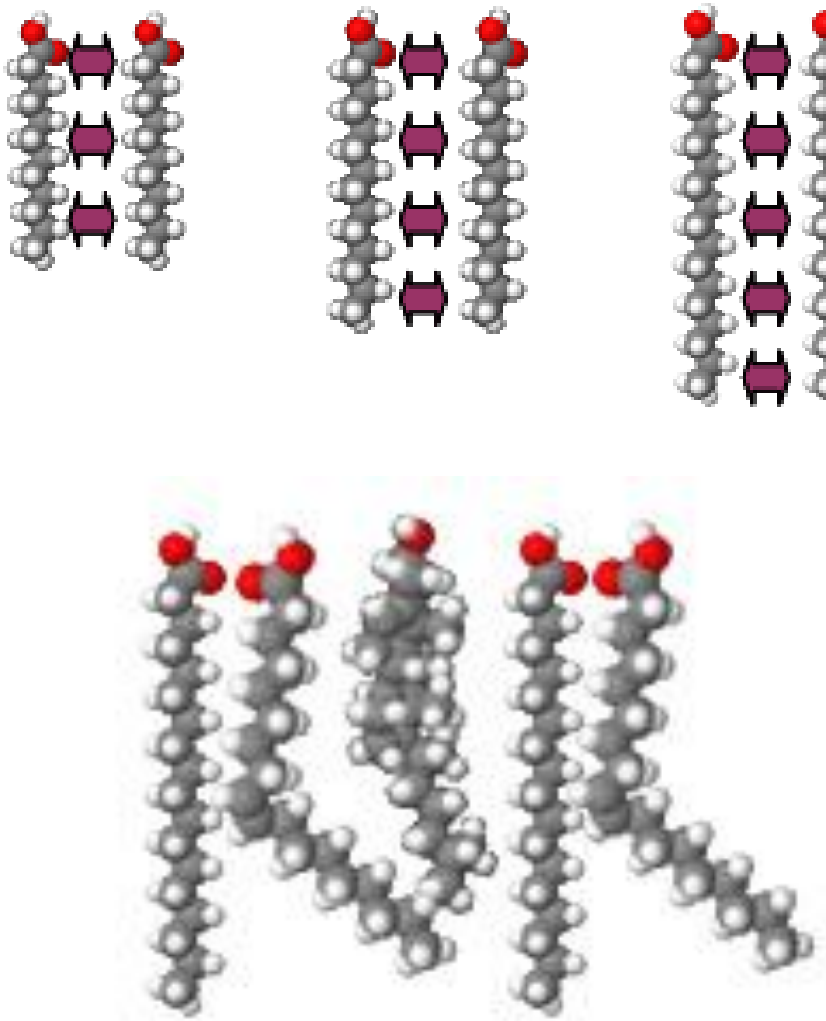
p.f. – 49 °C



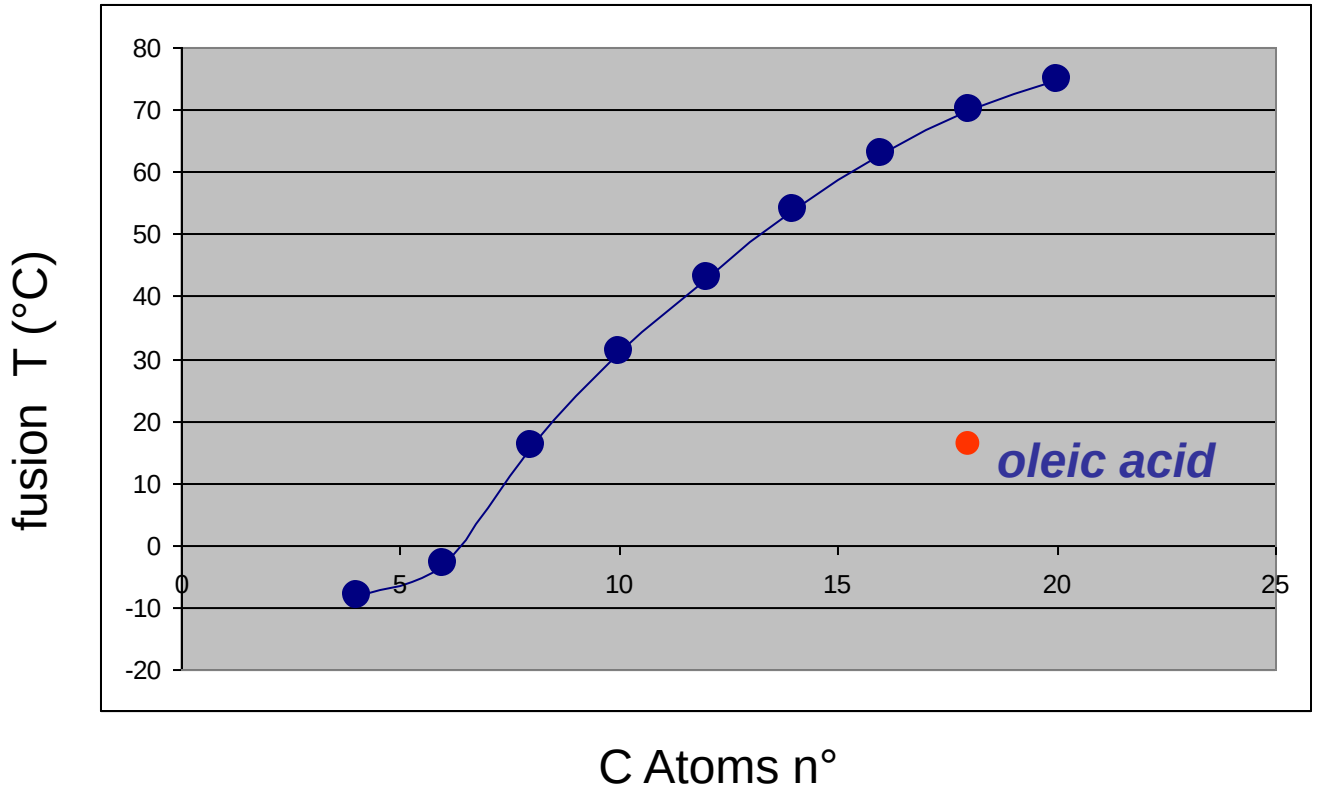
Oleic Acid- Monounsaturated Fatty Acid



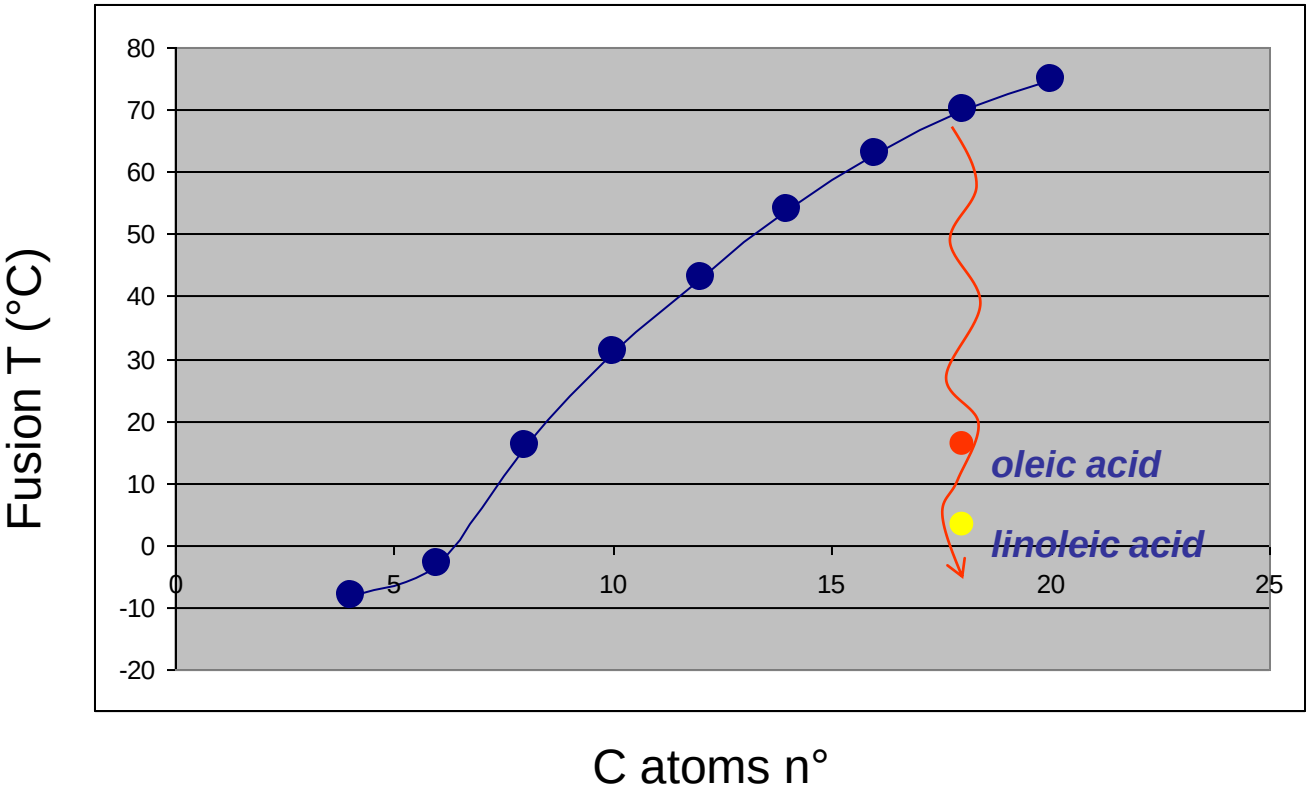
Linoleic Acid- c-9, c-12 Isomer



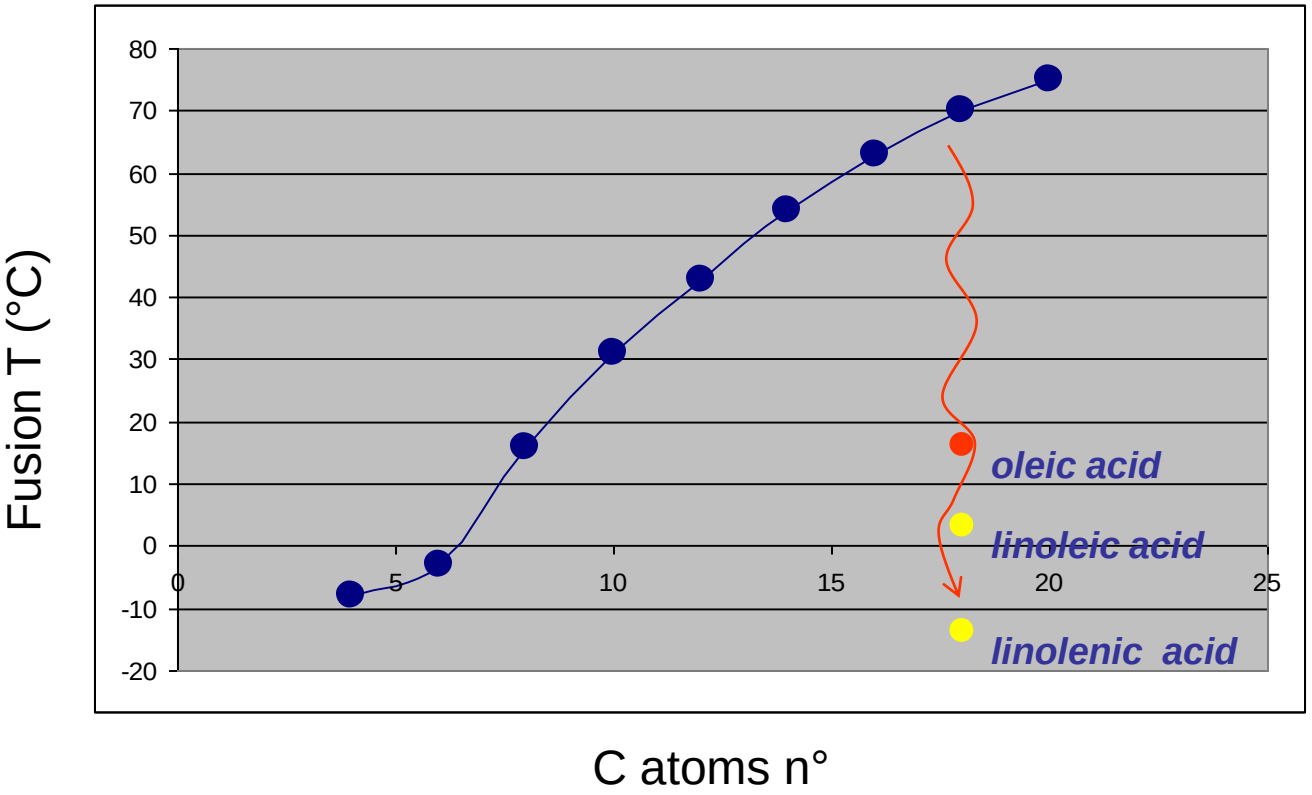
Monocarboxylic acids
Chain length
&
Single π bond



Monocarboxylic acids
Chain length
&
2 π bonds

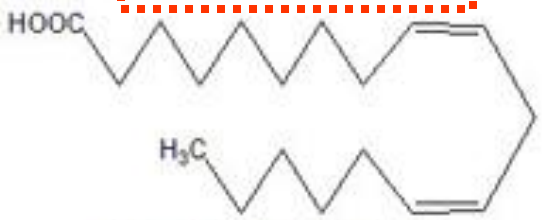


Monocarboxylic acids
Chain length
&
3 π bonds

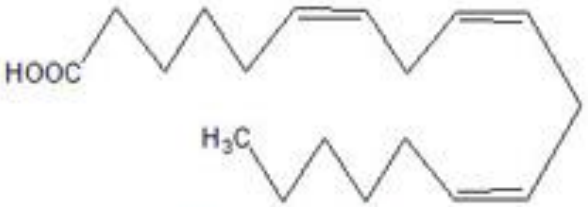


Omega fatty acids

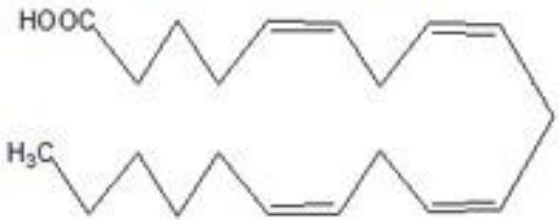
Omega-6 Fatty Acids



Linoleic Acid (18:2n-6)

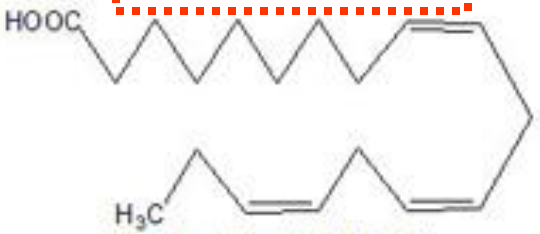


γ-Linolenic Acid (18:3n-6)

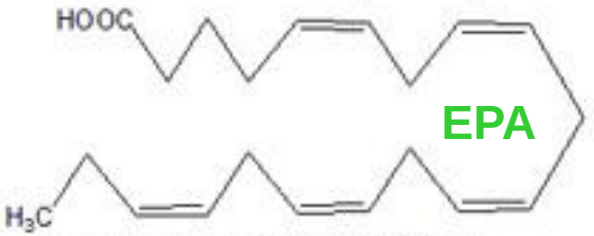


Arachidonic Acid (20:4n-6)

Omega-3 Fatty Acids

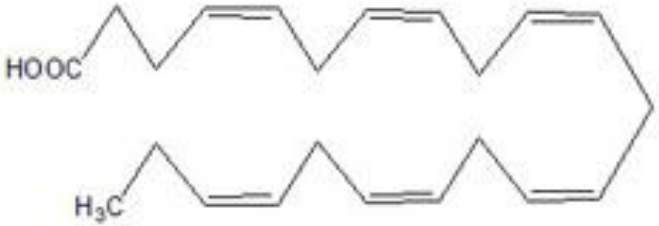


α-Linolenic Acid (18:3n-3)

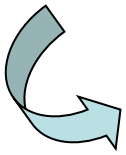


EPA

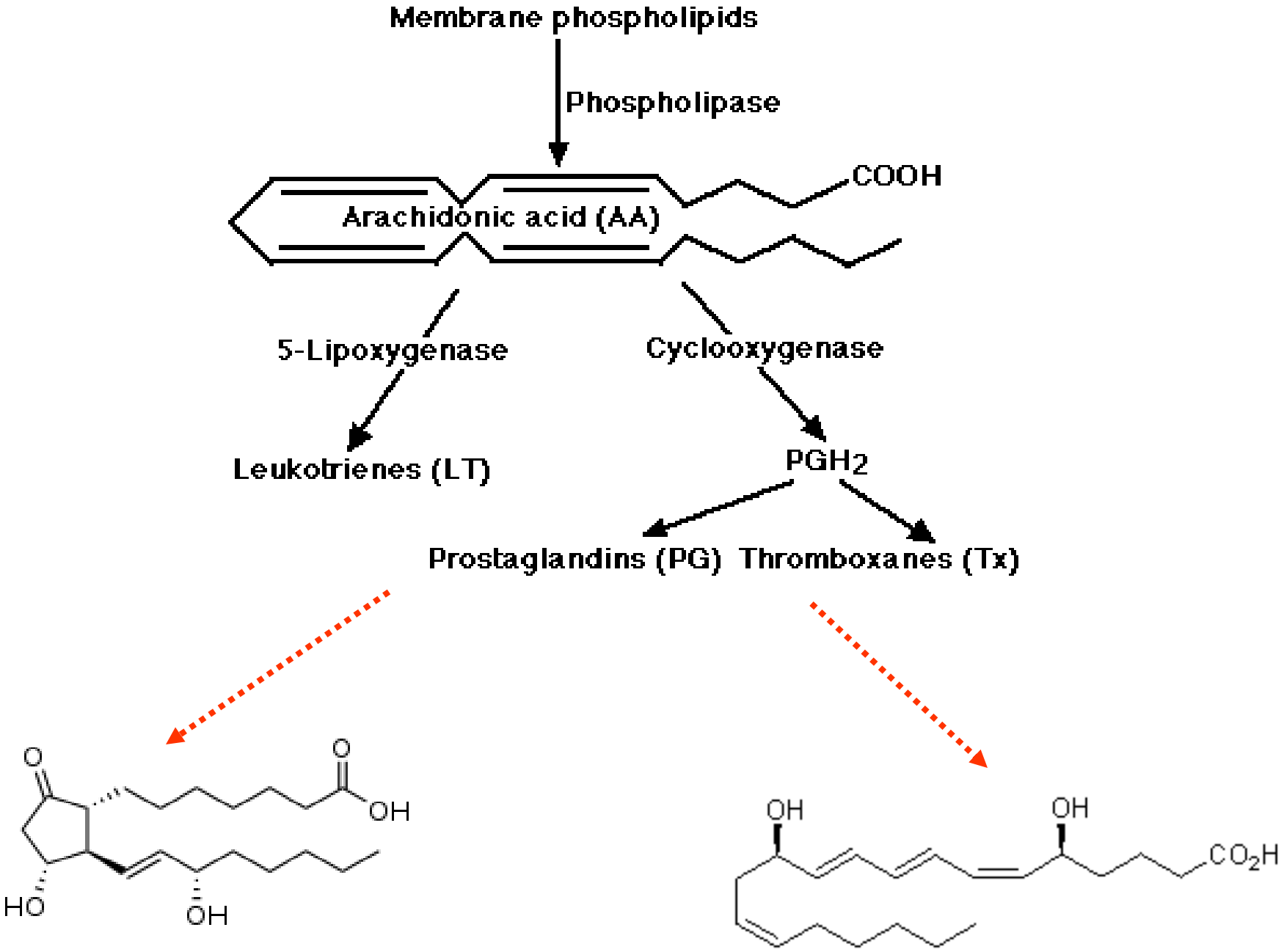
Eicosapentaenoic Acid (20:5n-3)



Docosahexaenoic Acid (22:6n-3)



- prostaglandines
- leucotrienes


Membrane phospholipids
Phospholipase
COOH
Arachidonic acid (AA)
5-Lipoxygenase
Cyclooxygenase
Leukotrienes (LT)
PGH2
Prostaglandins (PG)
Thromboxanes (Tx)
O
O
OH
HO
OH
OH
OH
CO2H