

M U N I
S C I

C5730 Biochemie - seminář

Mgr. Lukáš Faltinek

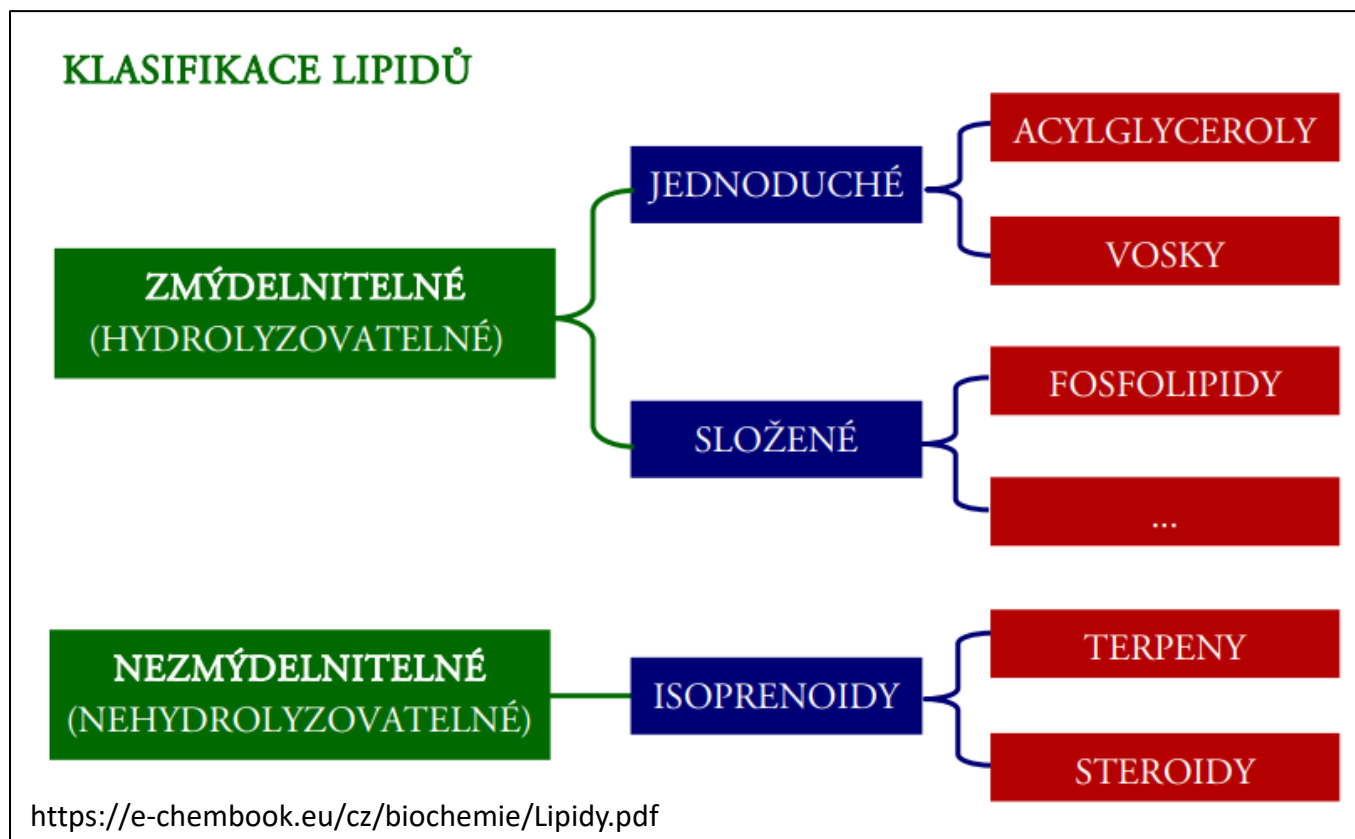
podzim 2024

M U N I
S C I

Lipidy

Charakteristika

- z chemického hlediska převážně **estery vyšších mastných kyselin a alkoholů**
- rozmanitá skupina látek: tuky, oleje, vosky, některé vitaminy a hormony



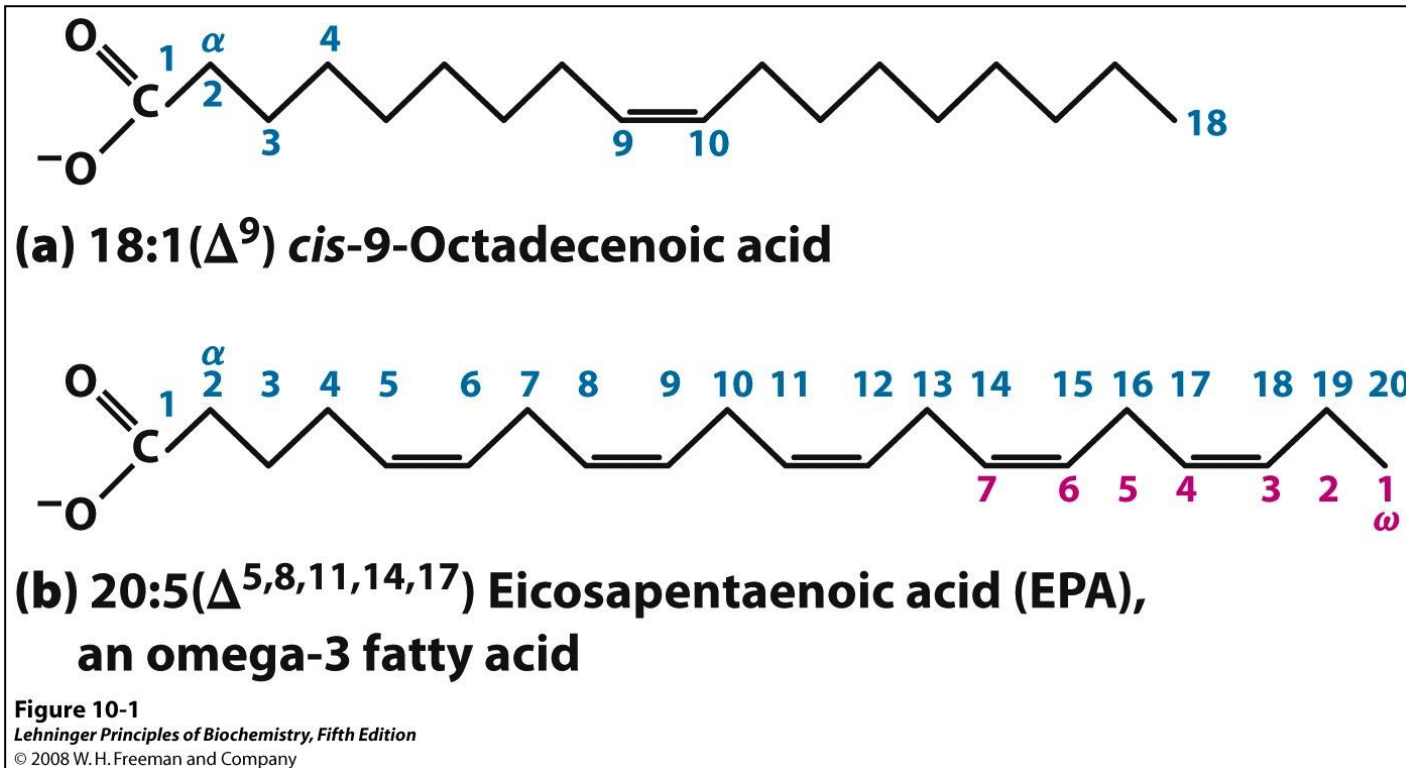
Vyšší mastné kyseliny

- jednosytné karboxylové kyseliny obsahující zpravidla 4 až 26 uhlíků
- nasycené: bez C=C vazeb X nenasyčené: s C=C vazbami

Zkrácený zápis MK

CN:M;X

Uhlík Počet uhlíků Počet dvojných vazeb Poloha dvojných vazeb



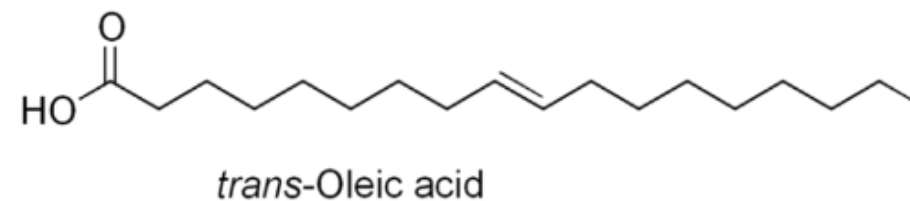
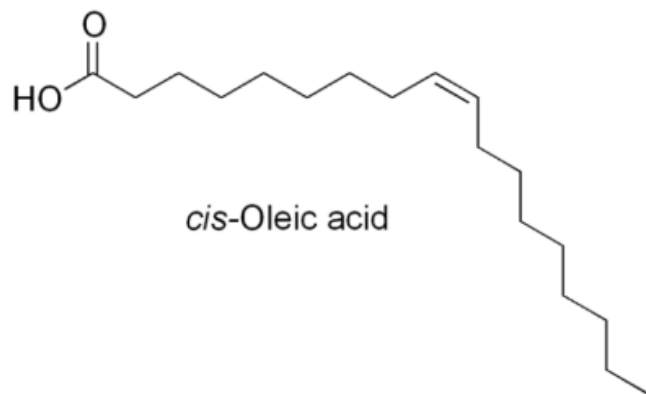
Nasyčené mastné kyseliny

Počet uhlíků	Triviální název	Systematický název
4	máselná	butanová
6	kapronová	hexanová
8	kaprylová	oktanová
10	kaprinová	dekanová
12	laurová	dodekanová
14	myristová	tetradekanová
16	palmitová	hexadekanová
18	stearová	oktadekanová
20	arachová	eikosanová
22	behenová	dokosanová
24	lignocerová	tetrakosanová
26	cerotová	hexakosanová

Nenasycené mastné kyseliny

Počet uhlíků a dvojných vazeb	Triviální název	Omega série	Poloha dvojných vazeb (všechny cis, s 1 výjimkou)
C16:1	Palmitolejová	ω 7	Δ^9
C18:1	Olejová	ω 9	Δ^9
C18:1	Elaidová	ω 9	Δ^9 (trans)
C24:1	Nervonová	ω 9	Δ^{15}
C18:2	Linolová	ω 6	$\Delta^{9, 12}$
C18:3	α-linolenová	ω 3	$\Delta^{9, 12, 15}$
C18:3	γ -linolenová	ω 6	$\Delta^{6, 9, 12}$
C20:4	Arachidonová	ω 6	$\Delta^{5, 8, 11, 14}$

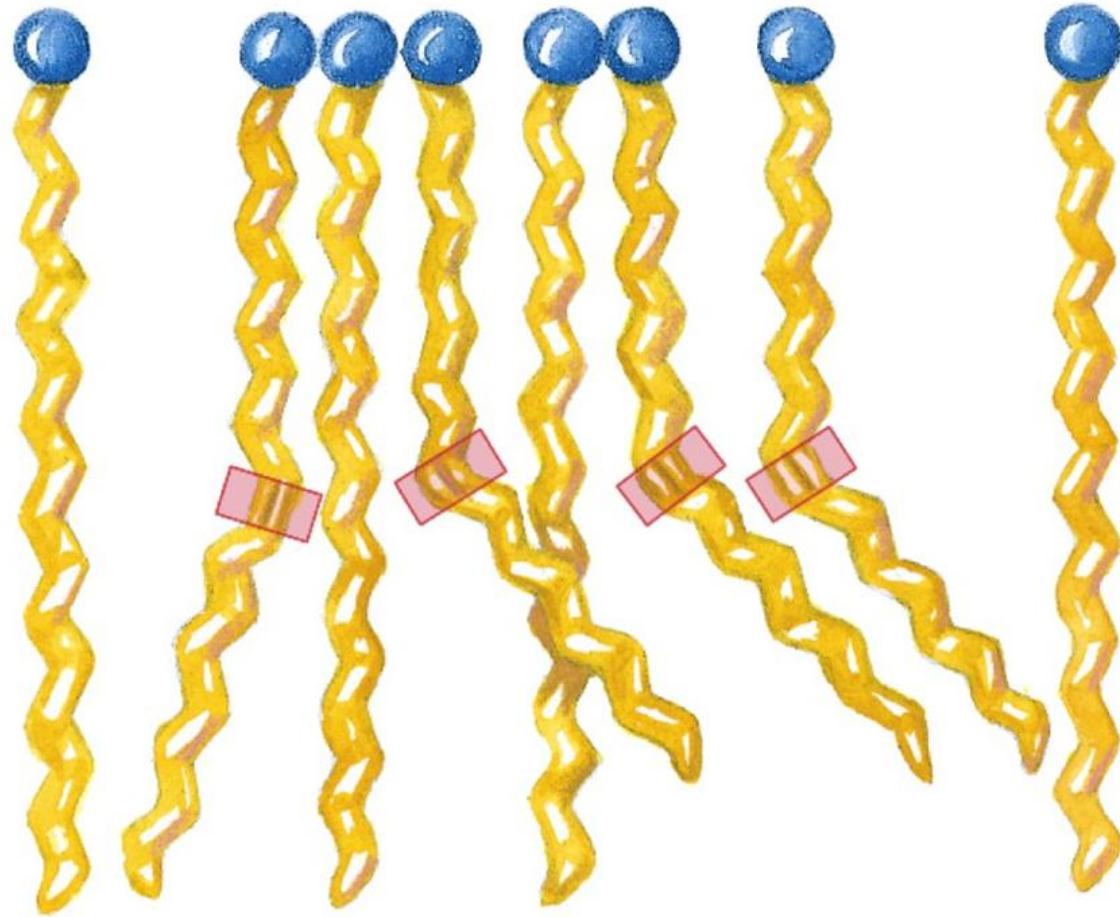
MATOUŠ, Bohuslav, et al. *Základy lékařské chemie a biochemie*.



Směs nasycených MK



Směs nasycených a nenasycených MK



Které uskupení bude mít vyšší teplotu tání?

Figure 10-2cd
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- teplota tání roste s délkou řetězce MK
- hlavním faktorem je však (ne)nasyčenost řetězců MK

Carbon skeleton	Melting point (°C)
12:0	44.2
14:0	53.9
16:0	63.1
18:0	69.6
20:0	76.5
24:0	86.0

Carbon skeleton	Melting point (°C)
16:1(Δ^9)	1 to -0.5
18:1(Δ^9)	13.4
18:2($\Delta^{9,12}$)	1-5
18:3($\Delta^{9,12,15}$)	-11
20:4($\Delta^{5,8,11,14}$)	-49.5

Table 10-1
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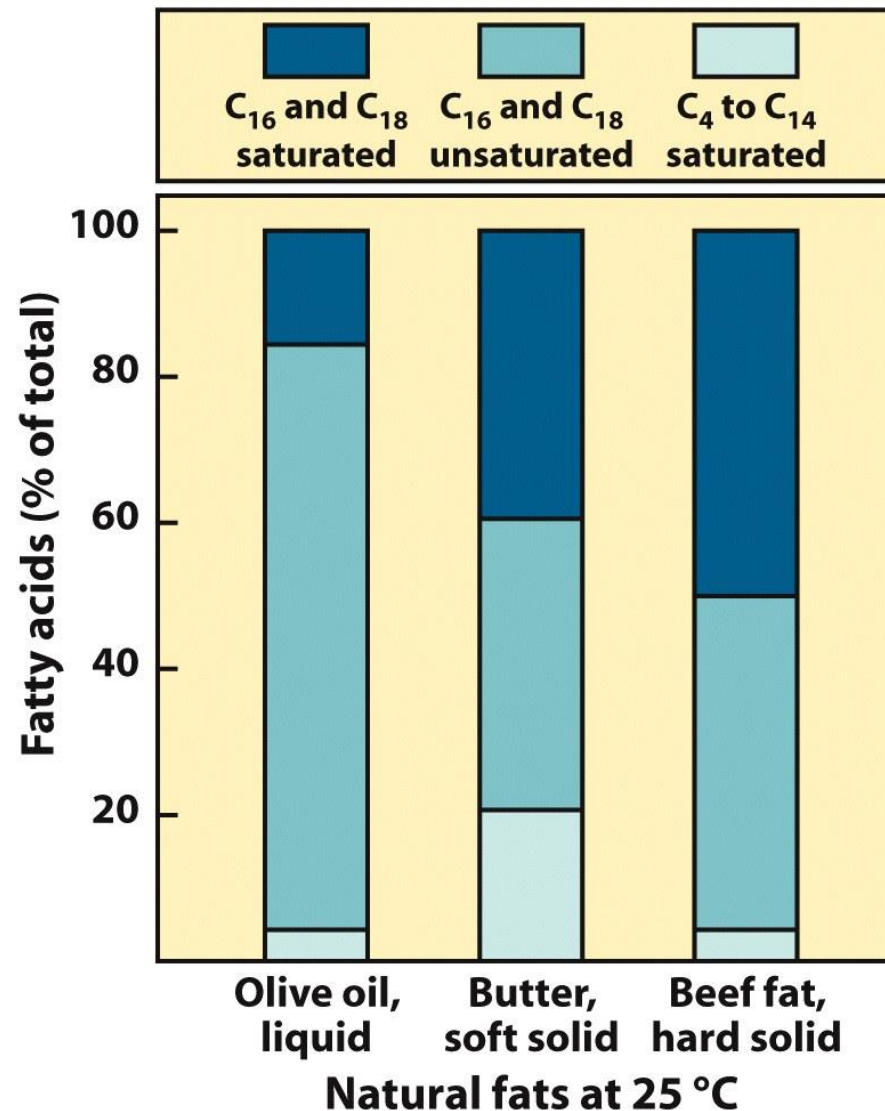
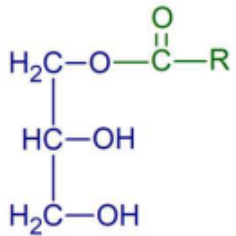


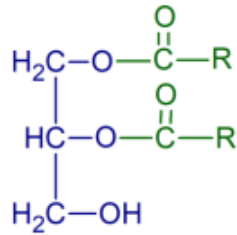
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Acylglyceroly

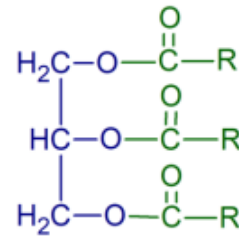
➤ estery MK a glycerolu



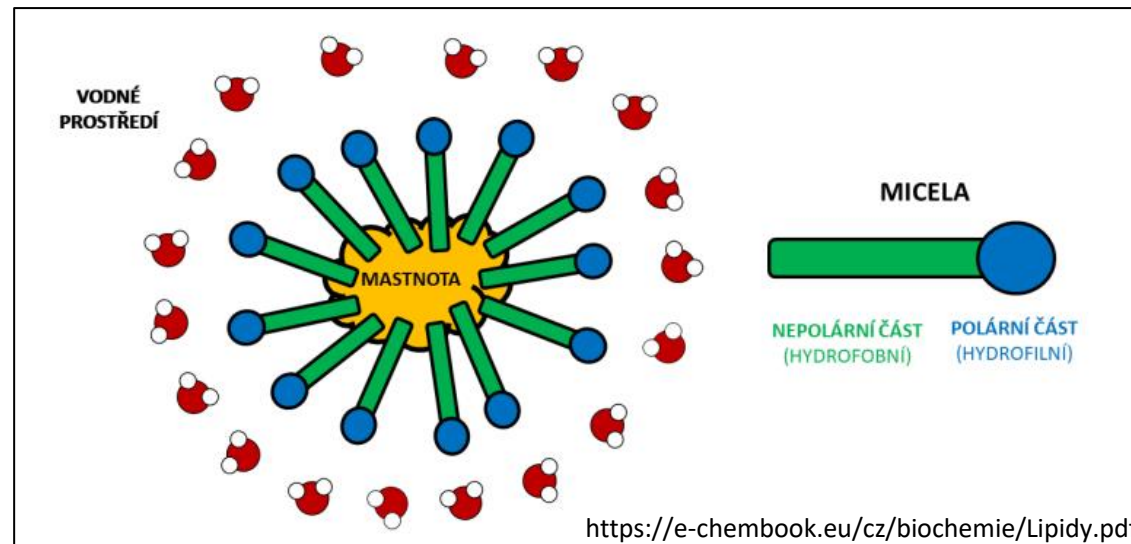
monoacylglycerol



diacylglycerol



triacylglycerol



Vosky

➤ estery MK a vyšších jednosytných alkoholů

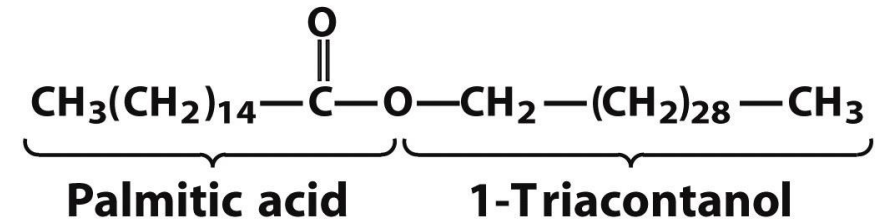
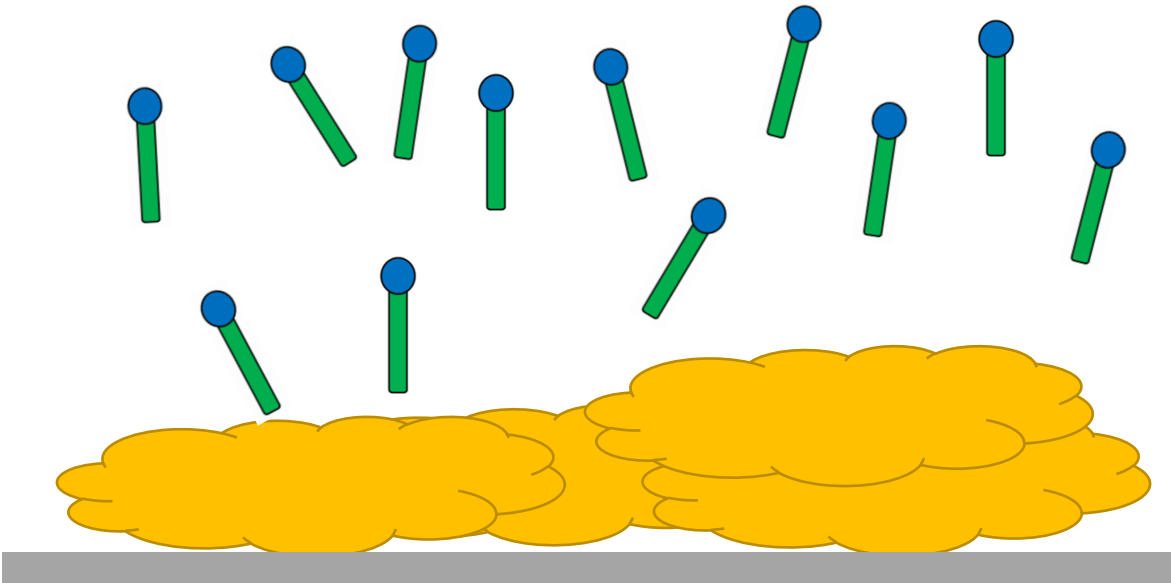
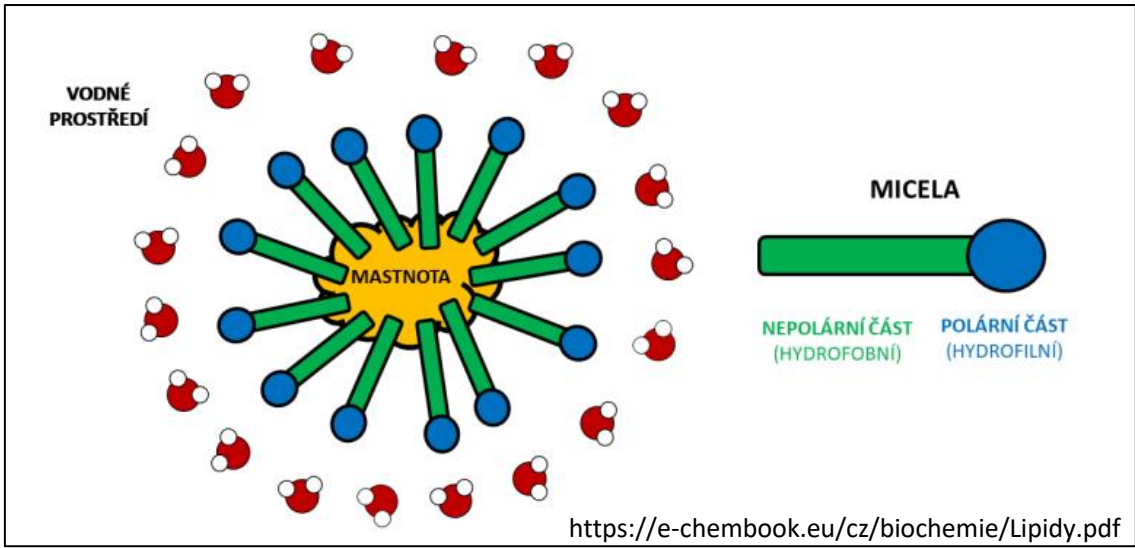
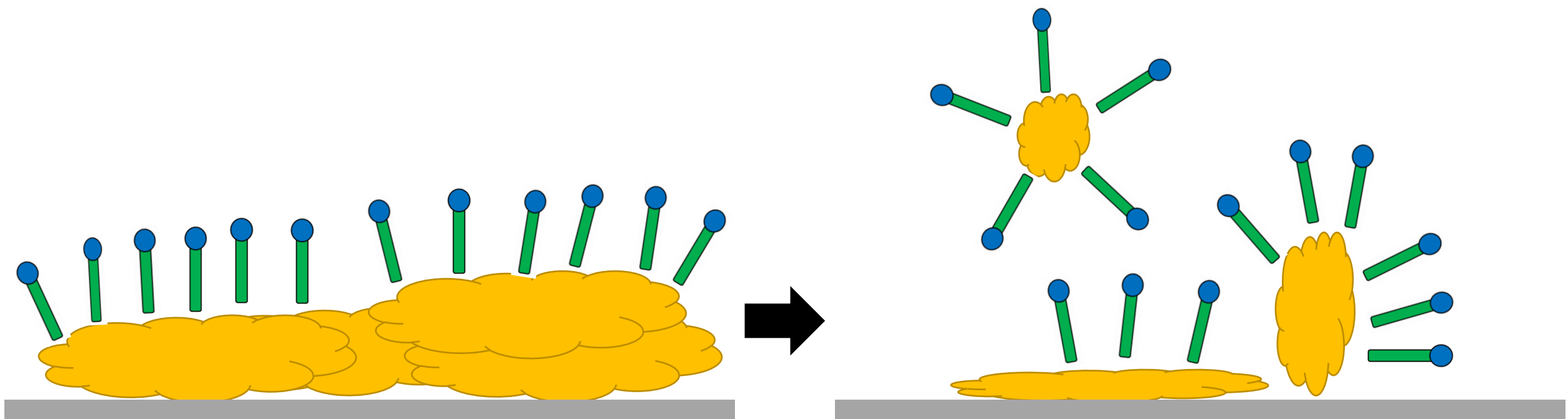
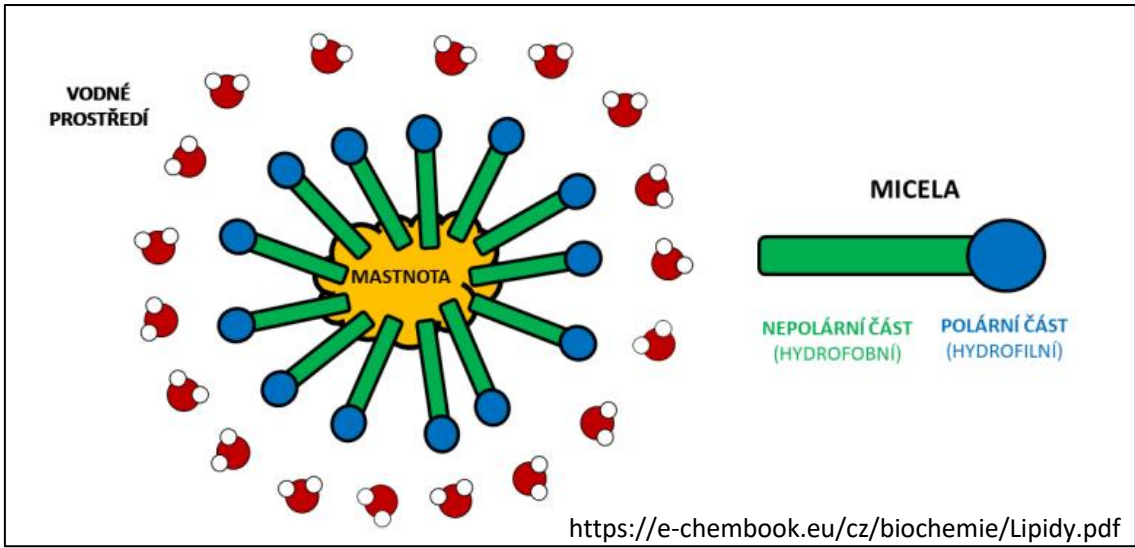


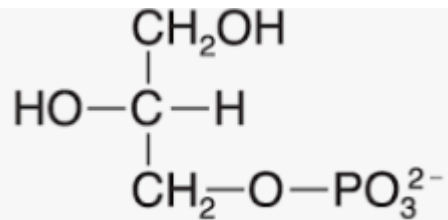
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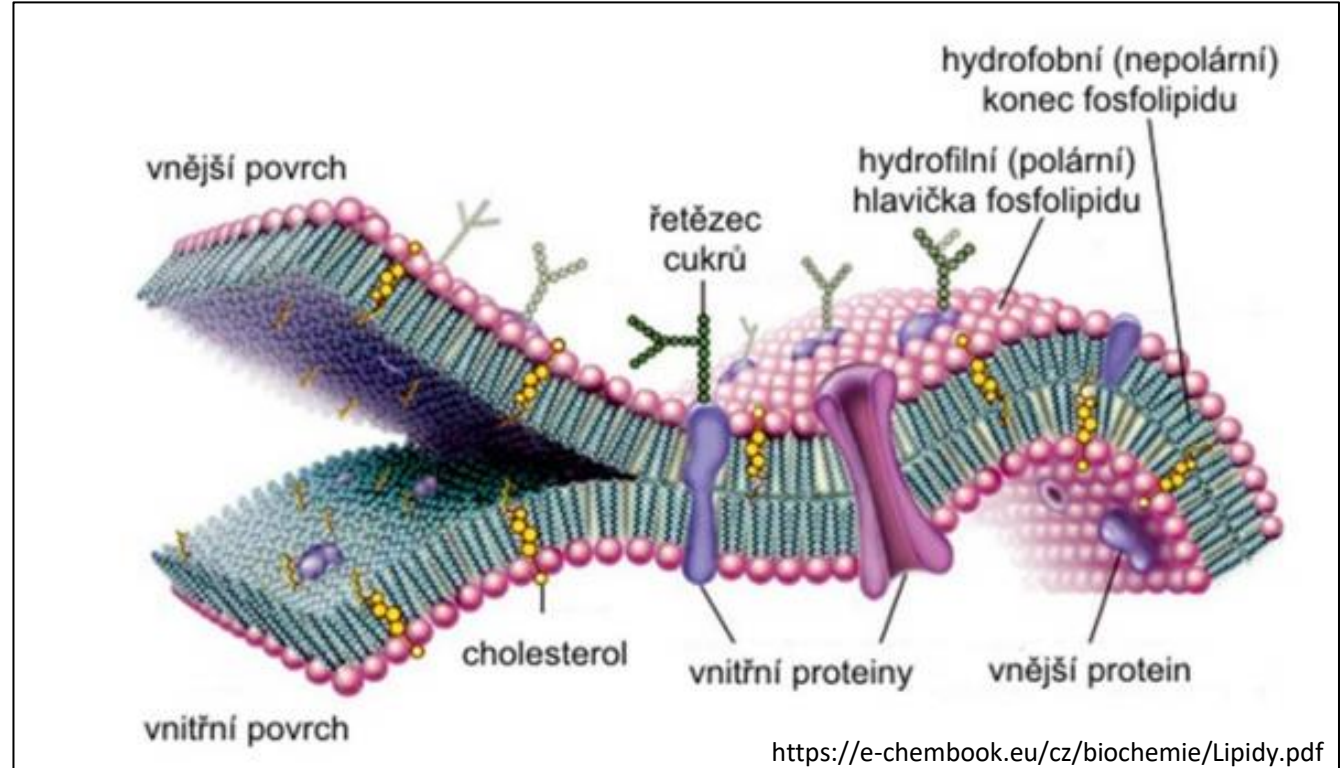
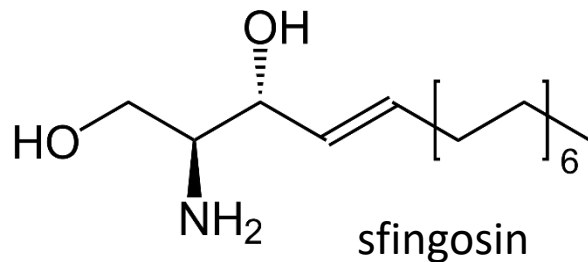


Složené lipidy

- **fosfolipidy:** další složkou je kyselina fosforečná
- **sfingolipidy:** další složkou je aminoalkohol sfingosin
- **glykolipidy:** další složkou je sacharid



glycerol-3-fosfát



<https://e-chembook.eu/cz/biochemie/Lipidy.pdf>

Rozdělení lipidů

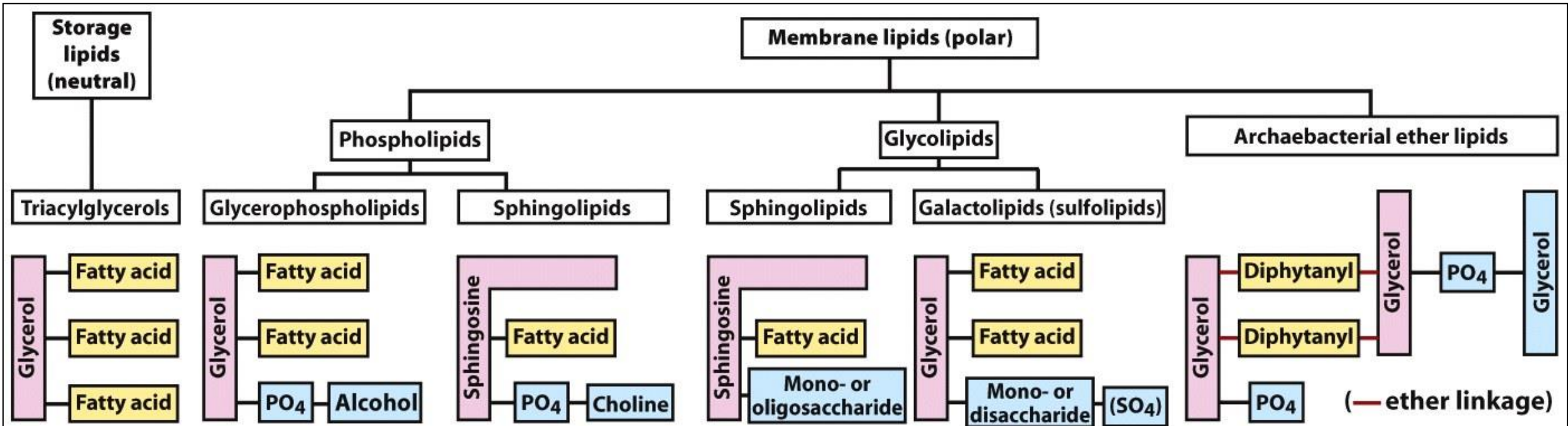


Figure 10-7

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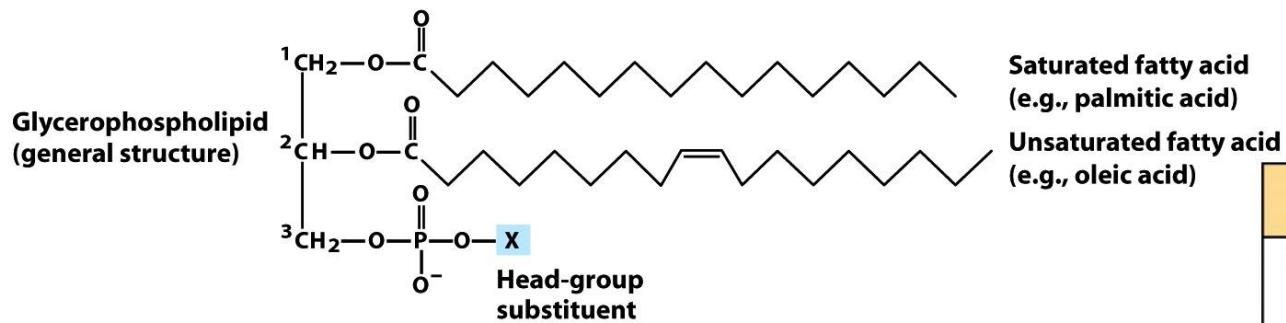


Figure 10-9 part 1
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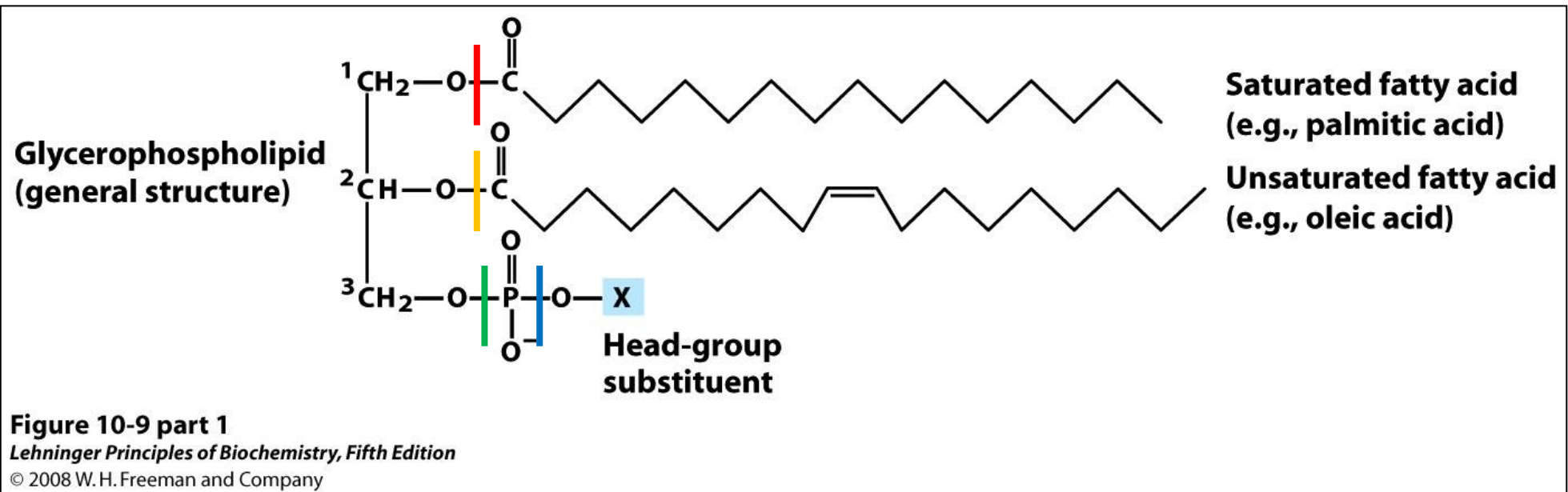
Některé významné glycerofosfolipidy

Name of glycerophospholipid	Name of X	Formula of X	Net charge (at pH 7)
Phosphatidic acid	—	— H	- 1
Phosphatidylethanolamine	Ethanolamine	— CH ₂ —CH ₂ —NH ₃ ⁺	0
Phosphatidylcholine	Choline	— CH ₂ —CH ₂ —N ⁺ (CH ₃) ₃	0
Phosphatidylserine	Serine	— CH ₂ —CH ⁺ (NH ₃) COO ⁻	- 1
Phosphatidylglycerol	Glycerol	— CH ₂ —CH(OH)—CH ₂ —OH	- 1
Phosphatidylinositol 4,5-bisphosphate	<i>myo</i> -Inositol 4,5-bisphosphate		- 4
Cardiolipin	Phosphatidylglycerol	— CH ₂ — CHOH— CH ₂ —O—P(=O)(O ⁻)—O—CH ₂ — CH—O—C(=O)—R ¹ CH ₂ —O—C(=O)—R ²	- 2

Figure 10-9 part 2
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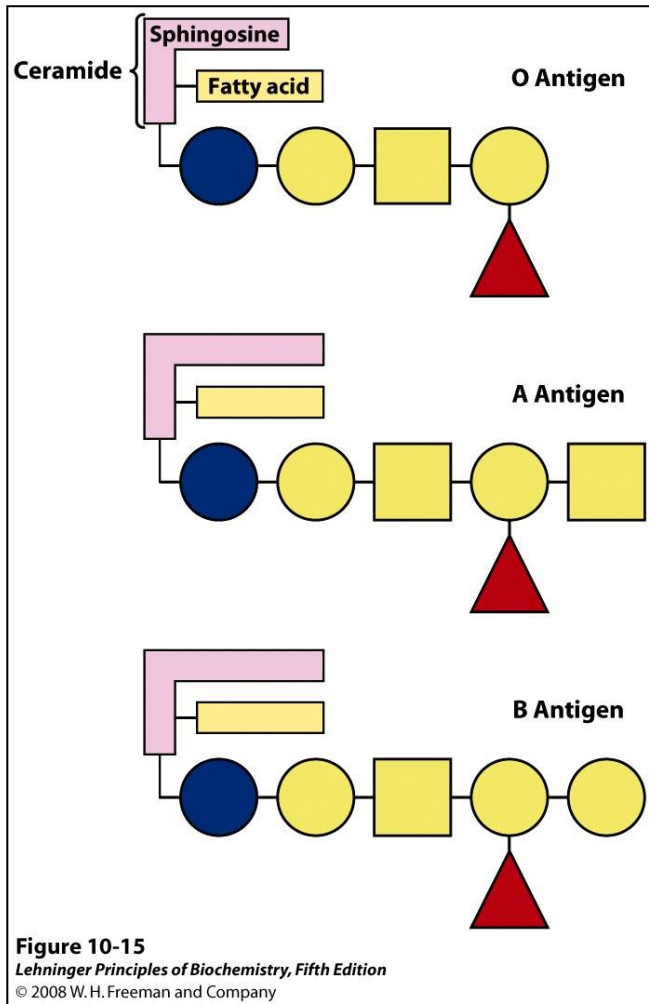
Enzymatické štěpení glycerofosfolipidů

účinek fosfolipas: A1, A2, C, D

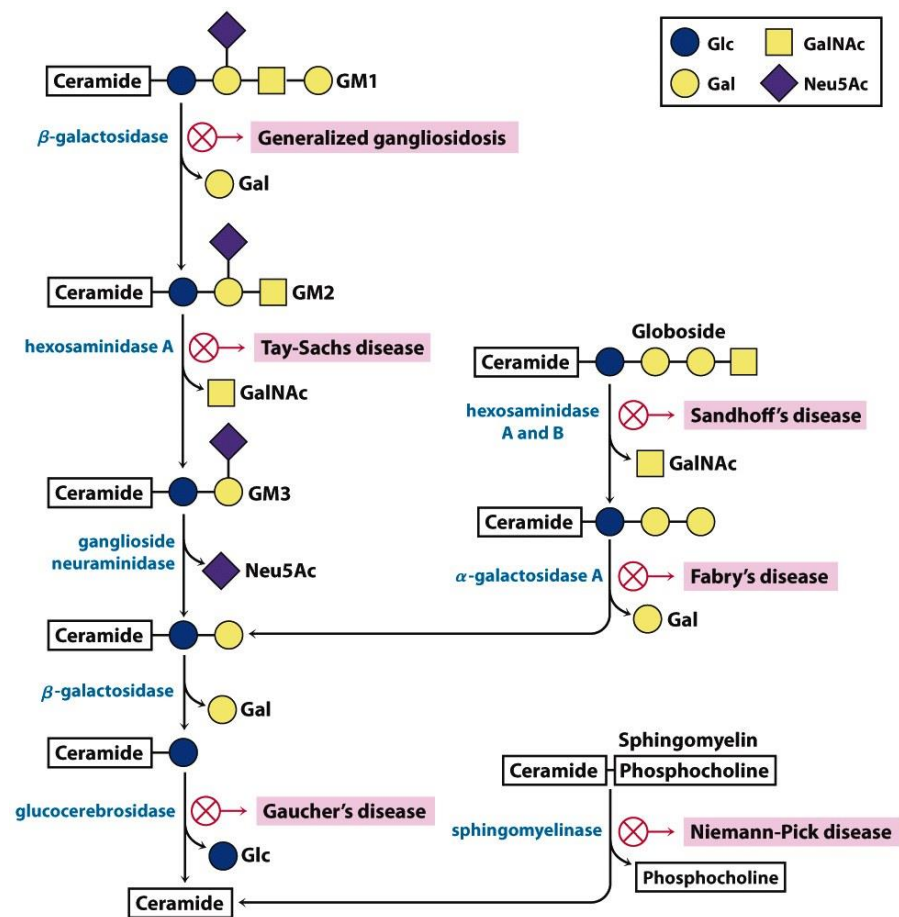


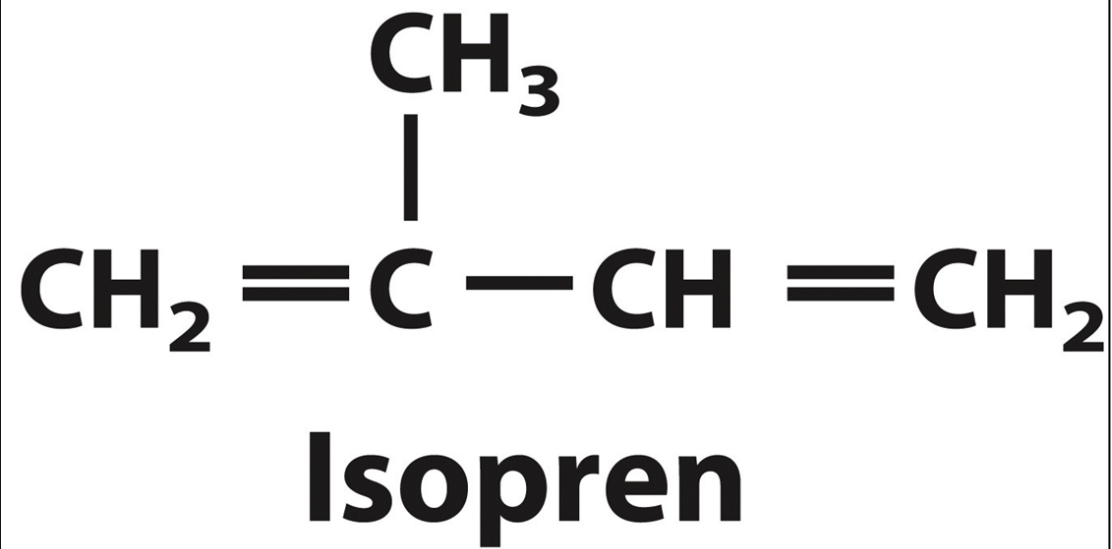
Významné sfingolipidy (glykolipidy)

antigeny krevních skupin AB0

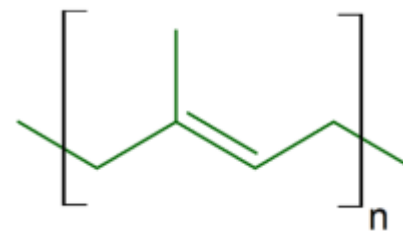


gangliosidy

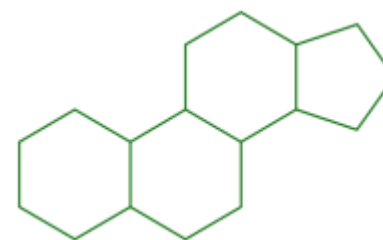




ISOPRENOIDY

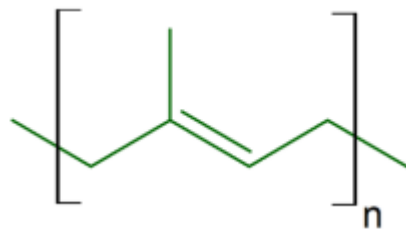


Terpeny

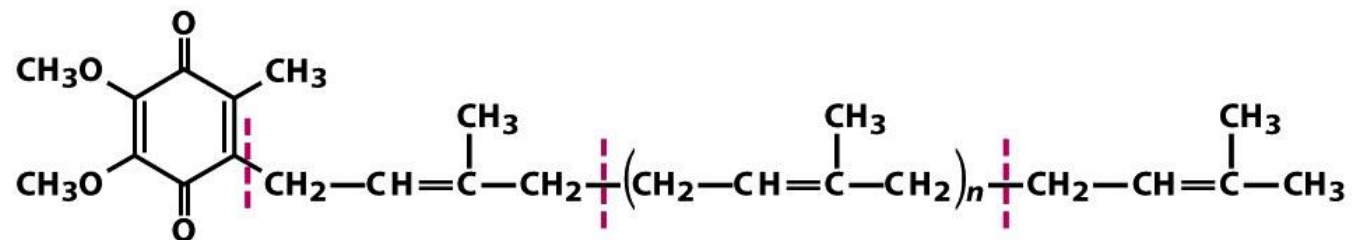


Steroidy

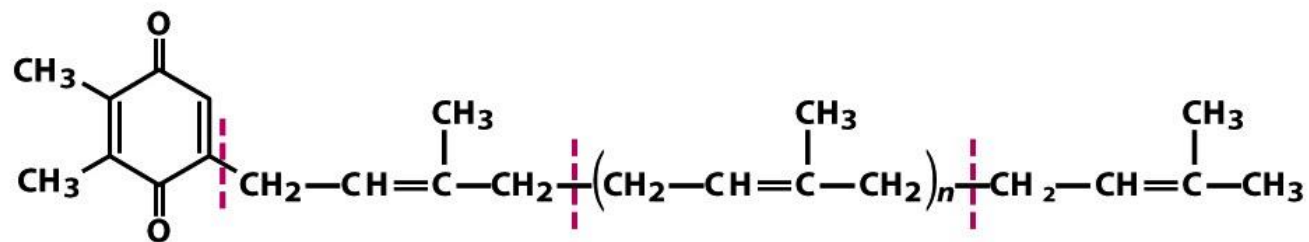
Významné terpeny



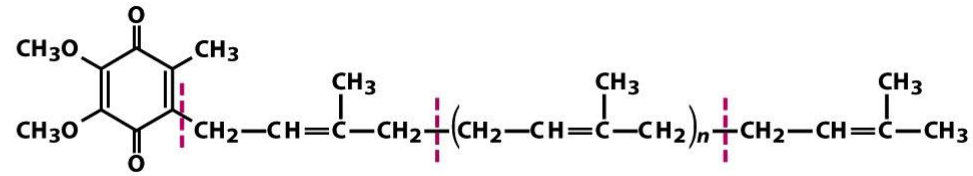
Ubiquinone: a mitochondrial electron carrier (coenzyme Q)
($n = 4$ to 8)



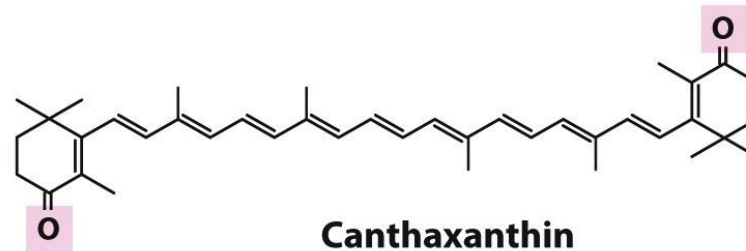
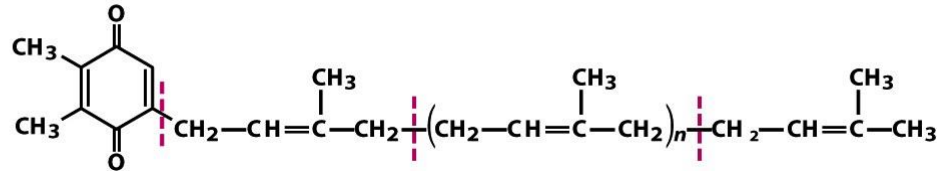
Plastoquinone: a chloroplast electron carrier ($n = 4$ to 8)



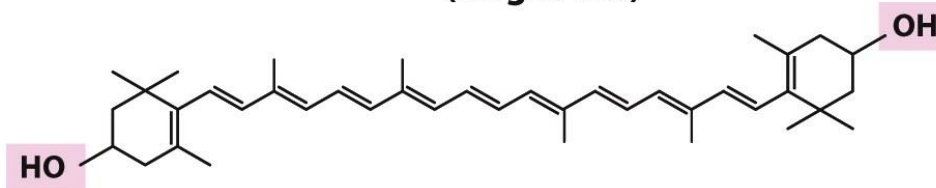
Ubiquinone: a mitochondrial electron carrier (coenzyme Q)
($n = 4$ to 8)



Plastoquinone: a chloroplast electron carrier ($n = 4$ to 8)



Canthaxanthin
(bright red)



Zeaxanthin
(bright yellow)



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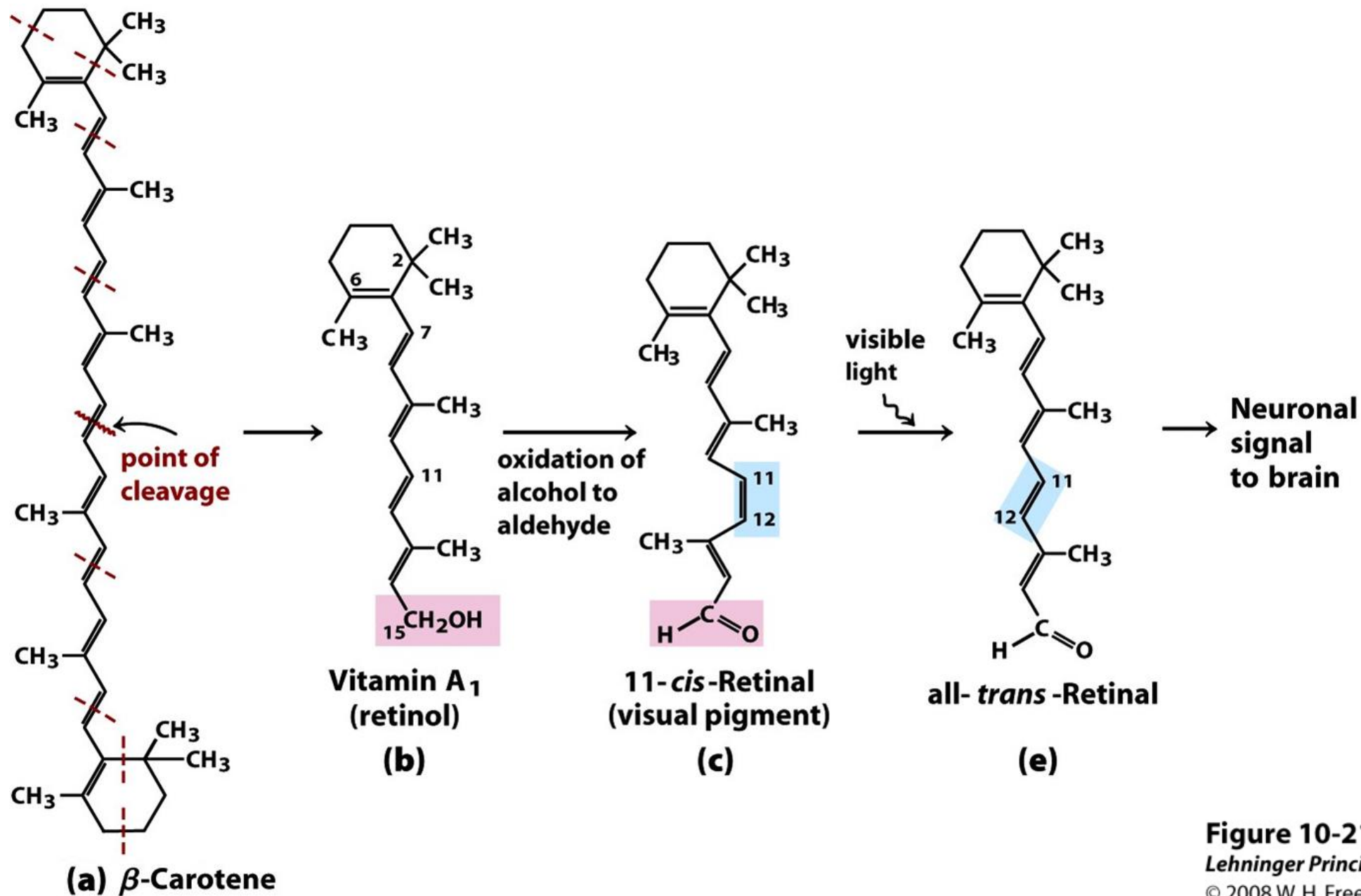
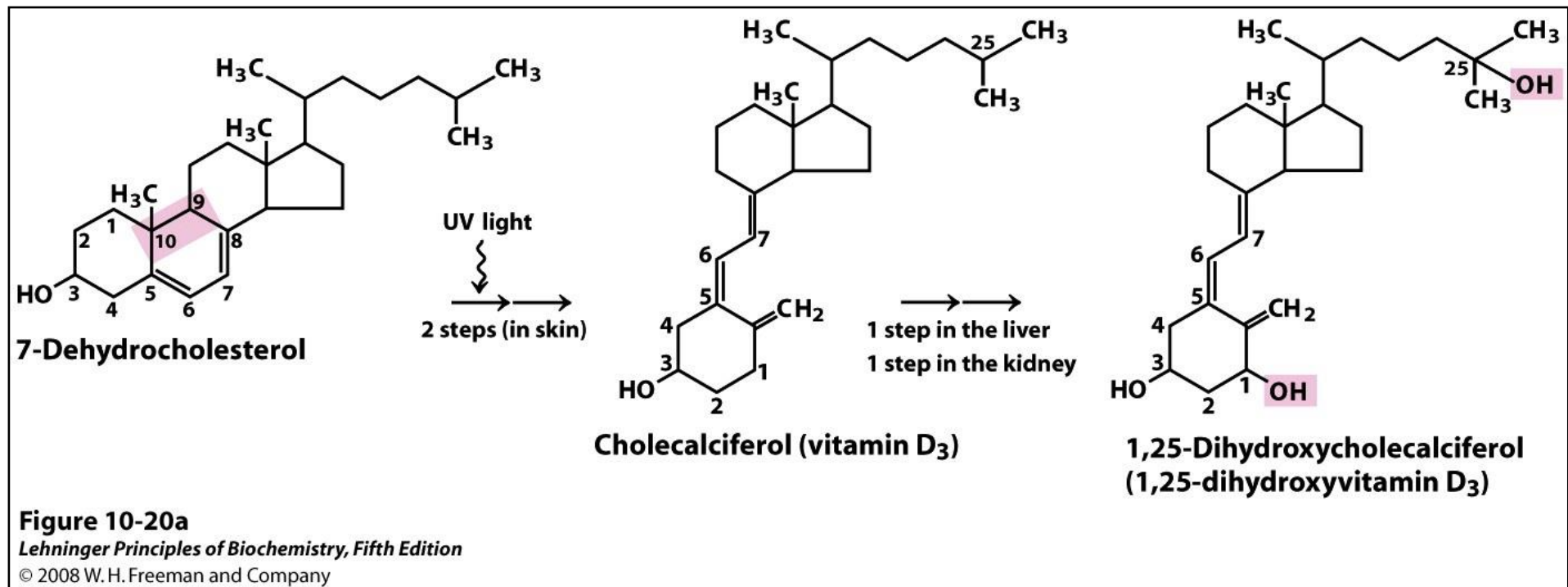
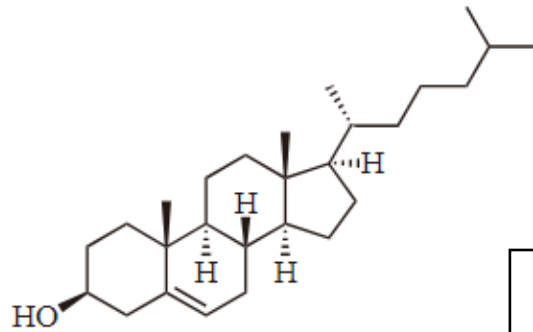
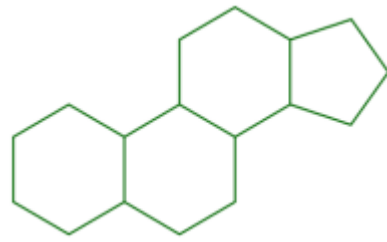


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Steroidy

Cholesterol



Steroidní hormony a léčiva

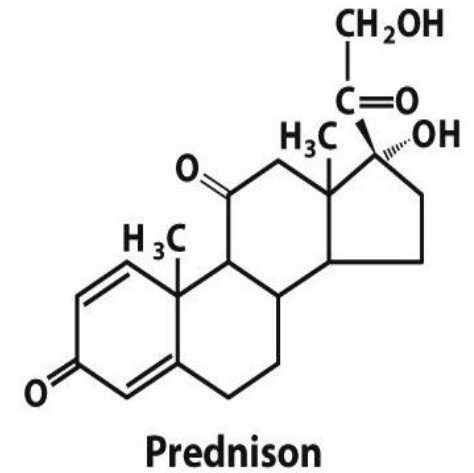
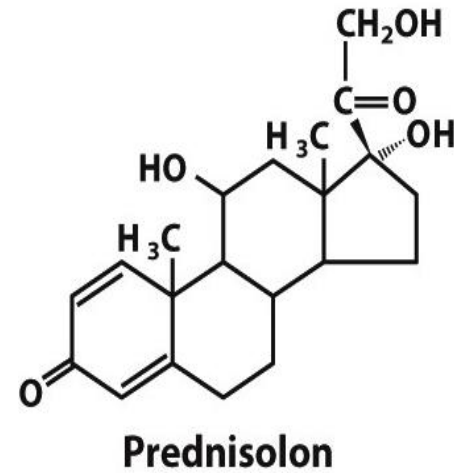
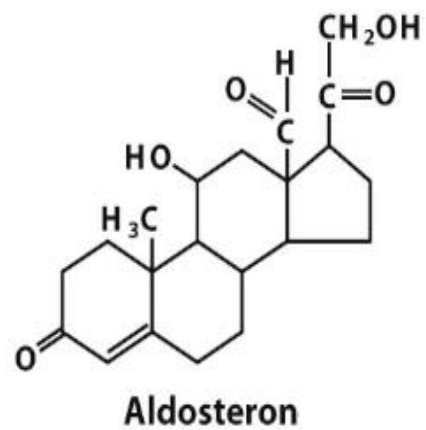
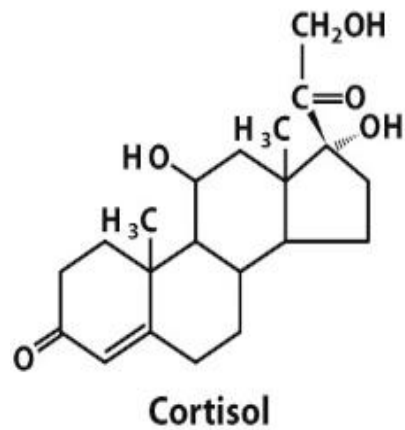
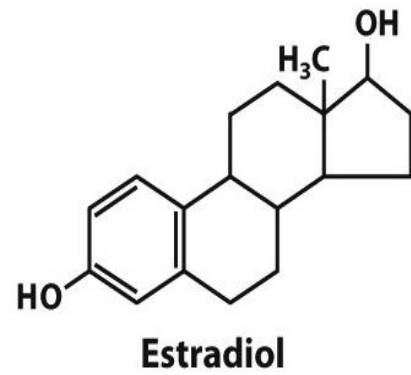
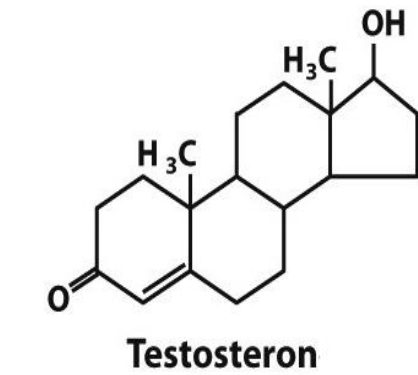


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