

Univerzitet u Beogradu – Fakultet veterinarske medicine

20I1009 BIOHEMIJA #03

BIOLOŠKI MOLEKULI: **Lipidi (masti)**

Priredio:

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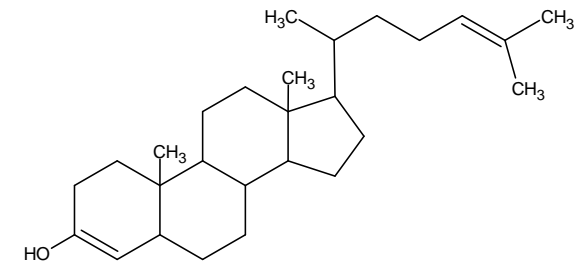
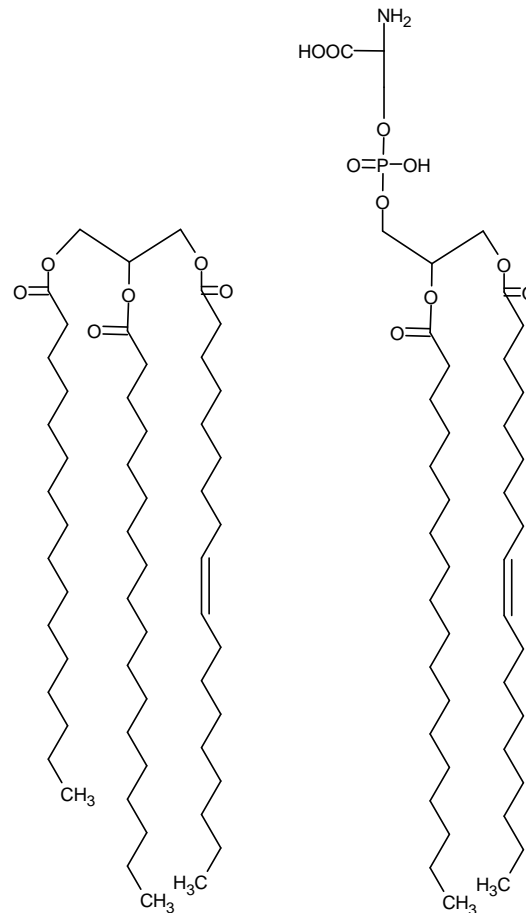
HEMIJSKE OSOBENOSTI LIPIDA

Lipidi su nepolarni ili slabo polarni molekuli - malo ili nikako se ne rastvaraju u vodi, a dobro u nepolarnim rastvaračima (npr. hloroformu i etru).

Po sastavu i građi su dosta raznorodni, pa ih je teško klasifikovati na osnovu strukture:

Iz praktičnih razloga lipidi se dele na:

- **trigliceride** (triacilgliceroli ili neutralne masti),
- **glicerofosfatide** (glicerofosfatidi, fosfogliceridi),
- **sfingolipide**,
- glikolipide (sfingolipidi koji sadrže ugljene hidrate),
- voskove,
- terpene,
- **steroidne** i
- *lipoproteinske sisteme.*

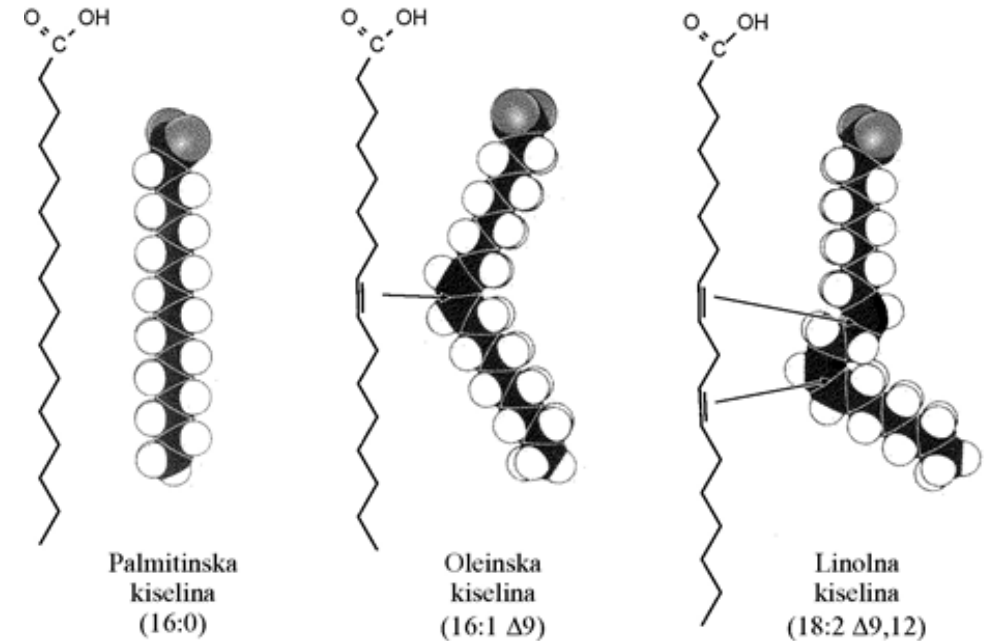


MASNE KISELINE

Neke od značajnijih masnih kiselina koje se nalaze u prirodnim mastima

Ime	Strukturna formula	Simbol	Poreklo
<i>Zasićene</i>			
Buterna	$\text{CH}_3(\text{CH}_2)_2\text{COOH}$	4:0	Buter
Kaprnska	$\text{CH}_3(\text{CH}_2)_4\text{COOH}$	6:0	Buter
Kaprilna	$\text{CH}_3(\text{CH}_2)_6\text{COOH}$	8:0	Kokosovo ulje
Kaprinska	$\text{CH}_3(\text{CH}_2)_8\text{COOH}$	10:0	Ulje palminog semena
Laurinska	$\text{CH}_3(\text{CH}_2)_{10}\text{COOH}$	12:0	Kokosovo ulje
Miristinska	$\text{CH}_3(\text{CH}_2)_{12}\text{COOH}$	14:0	Ulje mirisnog oraha
Palmitinska	$\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$	16:0	Život. i biljne masti
Stearinska	$\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$	18:0	Život. i biljne masti
Arahinska	$\text{CH}_3(\text{CH}_2)_{18}\text{COOH}$	20:0	Ulje kikirikija
<i>Nezasićene</i>			
Palmitoleinska	$\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$	16:1 ^{Δ9}	Buter
Oleinska	$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$	18:1 ^{Δ9}	Maslinovo ulje
Linolna	$\text{CH}_3(\text{CH}_2)_4(\text{CH}=\text{CHCH}_2)_2(\text{CH}_2)_6\text{COOH}$	18:2 ^{Δ9,12}	Ulje lanenog semena
Linoleinska	$\text{CH}_3\text{CH}_2(\text{CH}=\text{CHCH}_2)_3(\text{CH}_2)_6\text{COOH}$	18:3 ^{Δ9,12,15}	Ulje lanenog semena
Arahidonska	$\text{CH}_3(\text{CH}_2)_4(\text{CH}=\text{CHCH}_2)_4(\text{CH}_2)_2\text{COOH}$	20:4 ^{Δ5,8,11,14}	Lecitin
Nervonska	$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_{13}\text{COOH}$	24:1 ^{Δ15}	Nervni sistem

Opšta struktura i način kodiranja

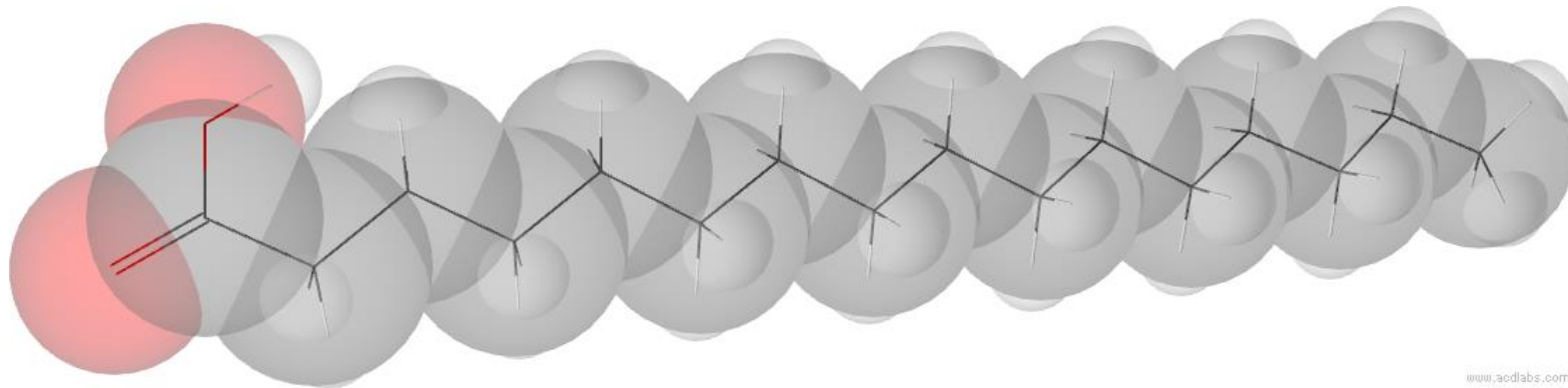
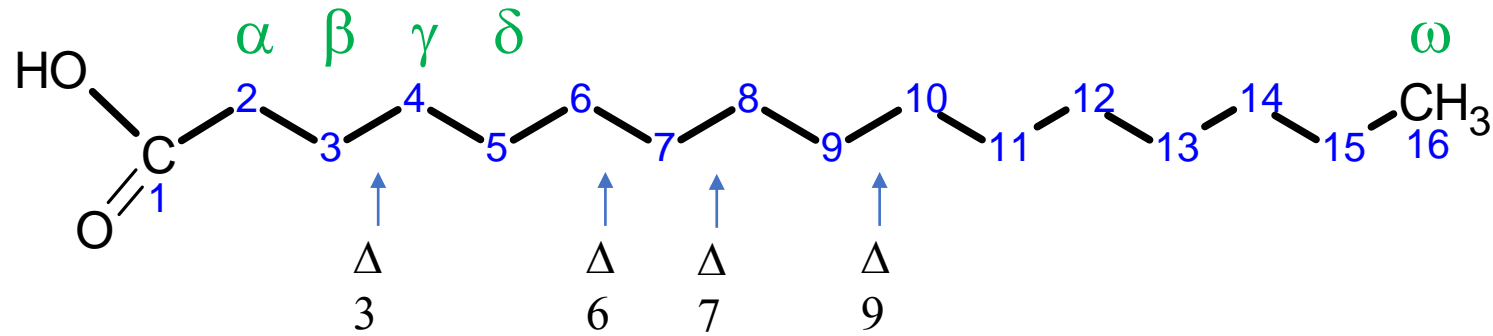


16:0 = 16 ugljenikovich (C) atoma, zasićena.

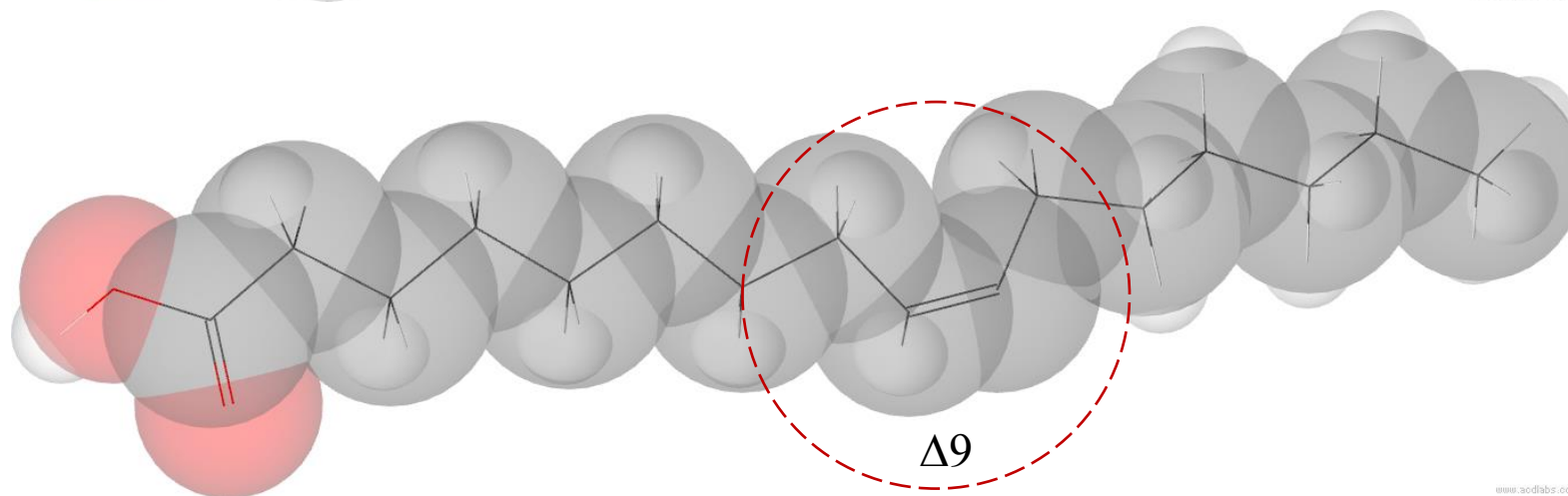
16:1 Δ9 = 16 ugljenikovich (C) atoma, jednom nezasićena, na 9 vezi od prvog C atoma.

16:2 Δ9, 12 = 16 ugljenikovich (C) atoma, dvaput nezasićena, na 9 i 12 vezi od prvog C atoma.

MASNE KISELINE



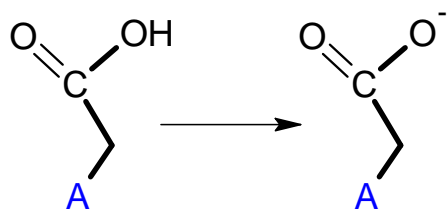
Palmitinska kiselina



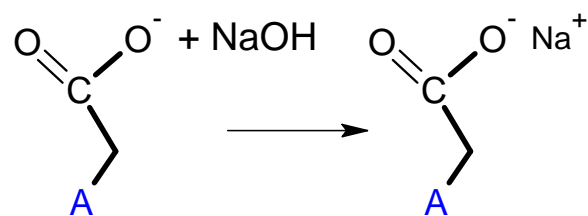
Palmitoleinska kiselina

REAKCIJE MASNIH KISELINA

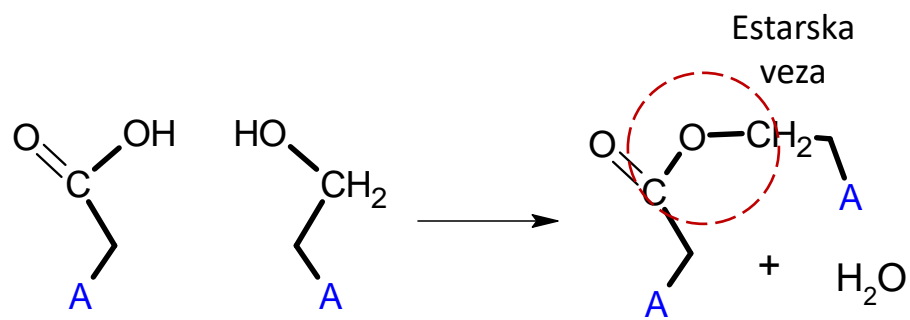
Reakcije karboksine grupe



Elektrolitička disocijacija

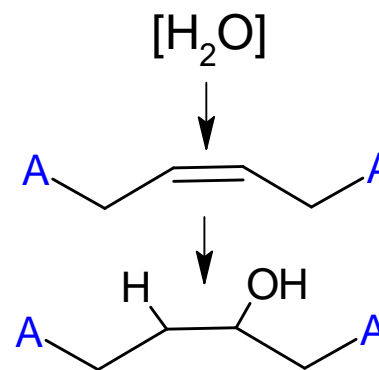


Saponifikacija

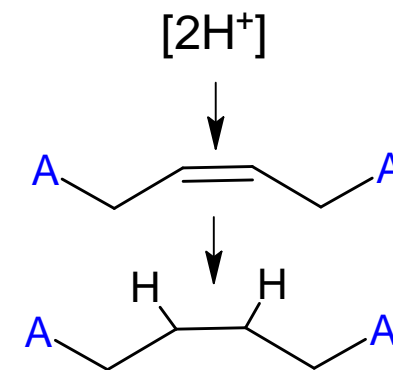


Esterifikacija

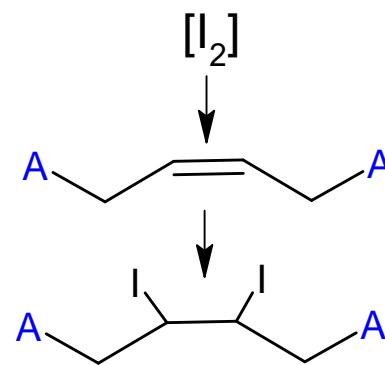
Reakcije na dvogubu vezu



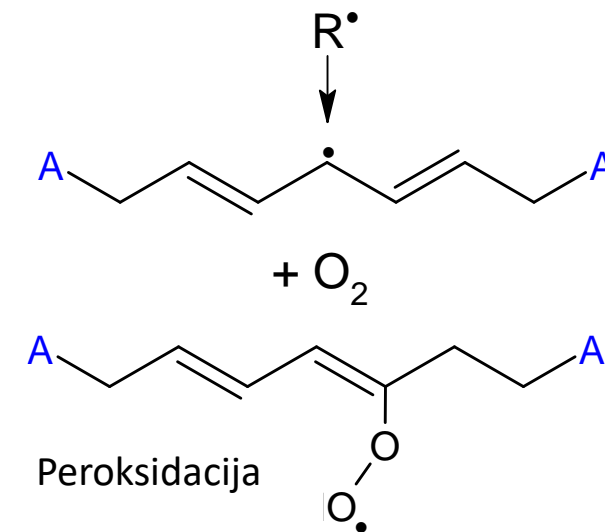
Hidroksilacija



Saturacija



Adicija

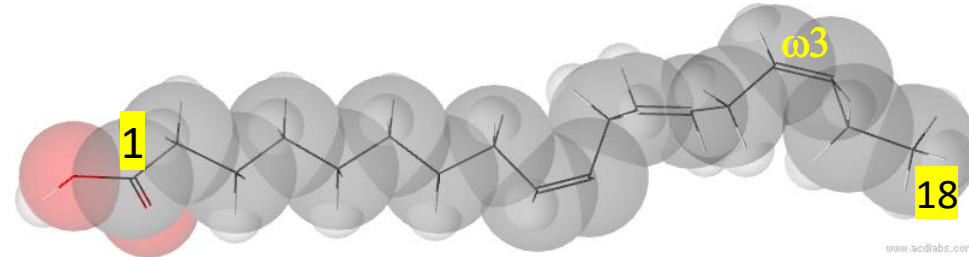


Peroksidacija

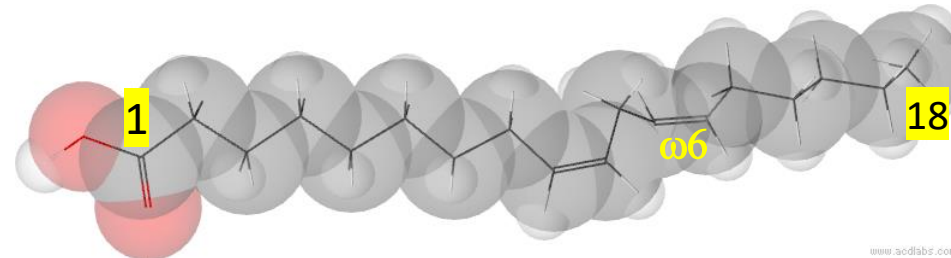
ESENCIJALNE MASNE KISELINE I NJIHOVI BIOAKTIVNI DERIVATI

Polinezasićene masne kiseline sa 18 C - atoma:

- α -linoleinska kiselina (ALA) (18:3, ω 3)

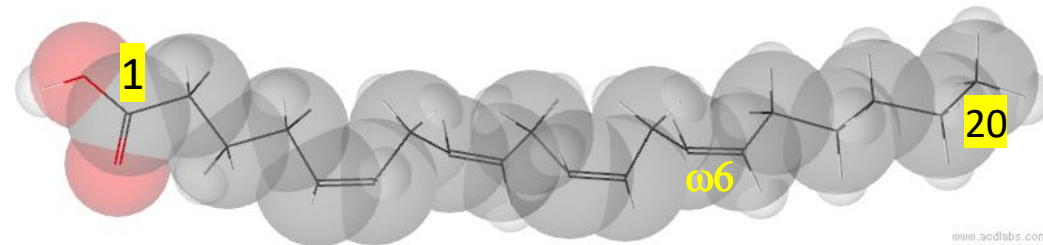


- Linolna (LA) (18:2, ω 6)



Polinezasićene masne kiseline sa 20 C - atoma:

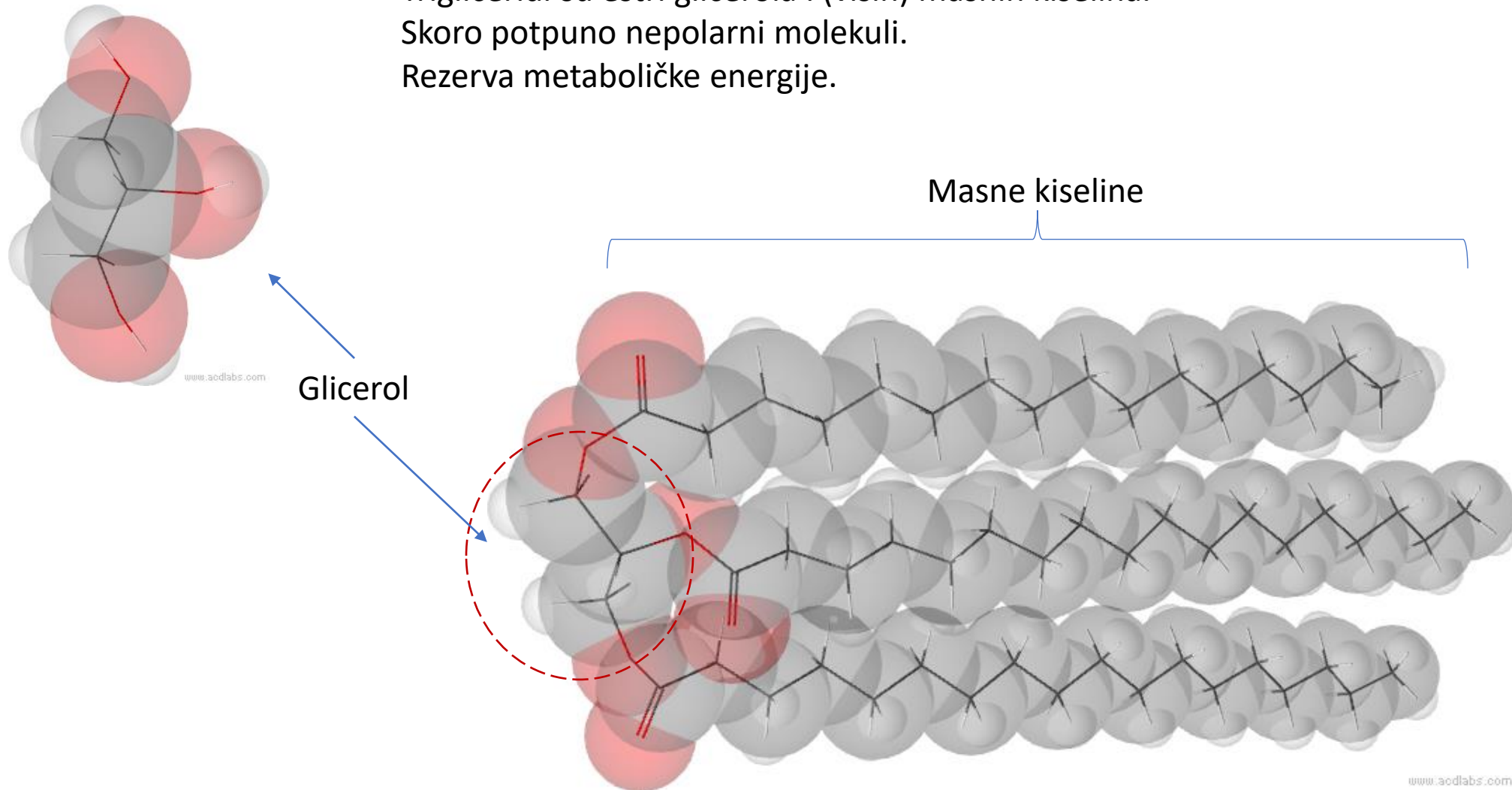
- Arahidonska kiselina (AA) (20:4, ω 6)



Eikosanoidi, bioaktivni derivati arahidonske kiseline: prostaglandini, tromboksani i leukotieni.

TRIGLICERIDI (PROSTE MASTI/ULJA)

Trigliceridi su estri glicerola i (viših) masnih kiselina.
Skoro potpuno nepolarni molekuli.
Rezerva metaboličke energije.

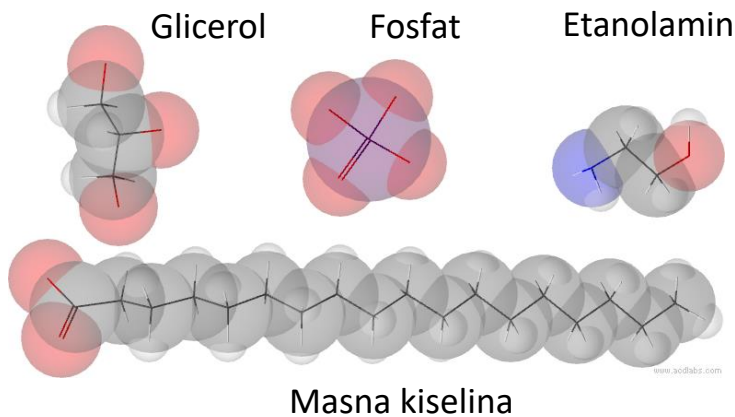


GLICEROFOSFATIDI (FOSFOLIPIDI)

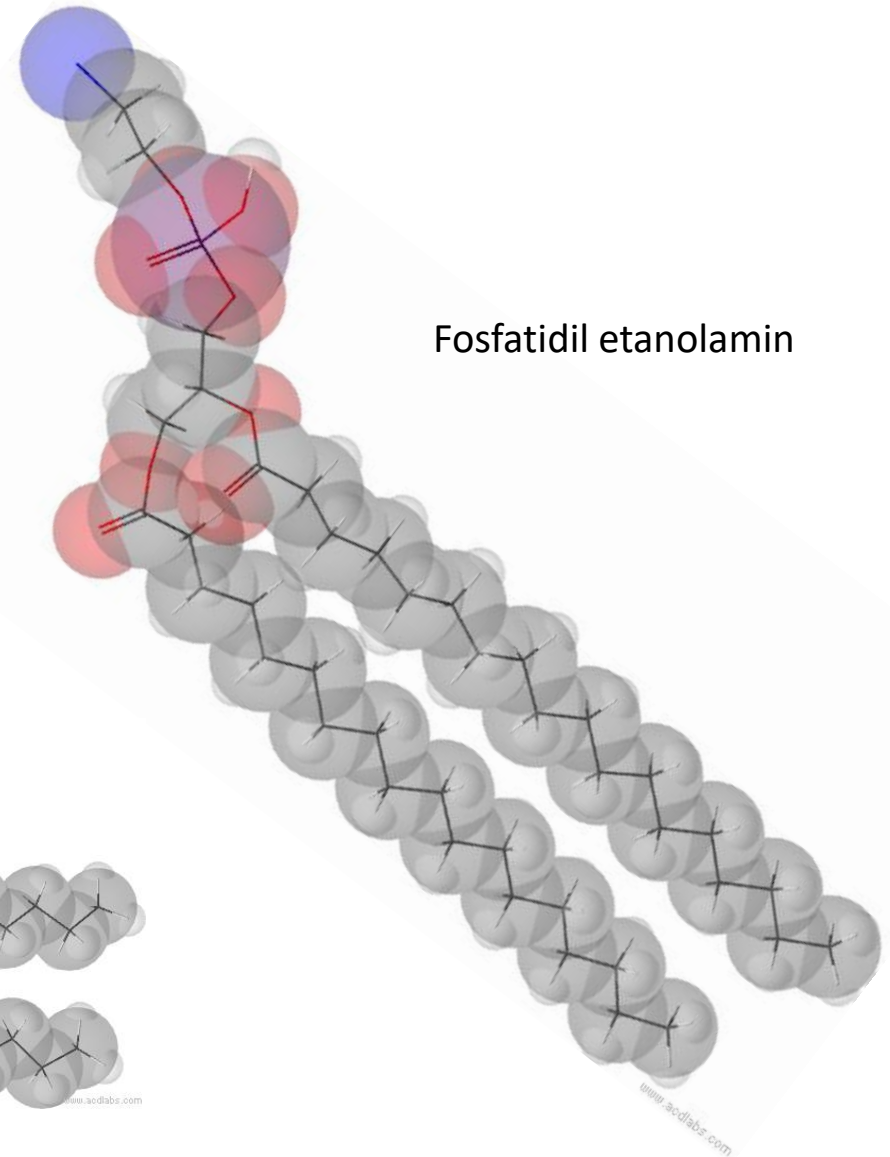
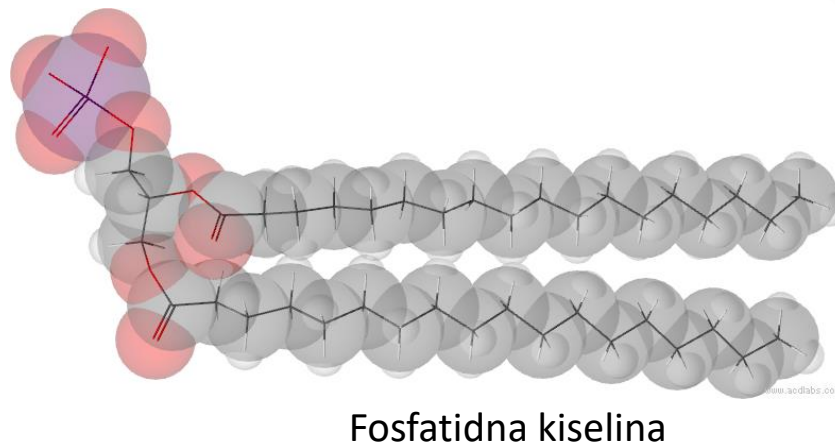
Glicerofosfatidi se sastoje iz glicerola, dve masne kiseline, fosfata i nekog polarnog molekula (npr. etanolamin, holin, serin, lizin, inozitol itd).

Amfipolarni molekuli.

Izgradnja lipidne komponente bioloških membrana.



Komponente molekula glicerofosfatida

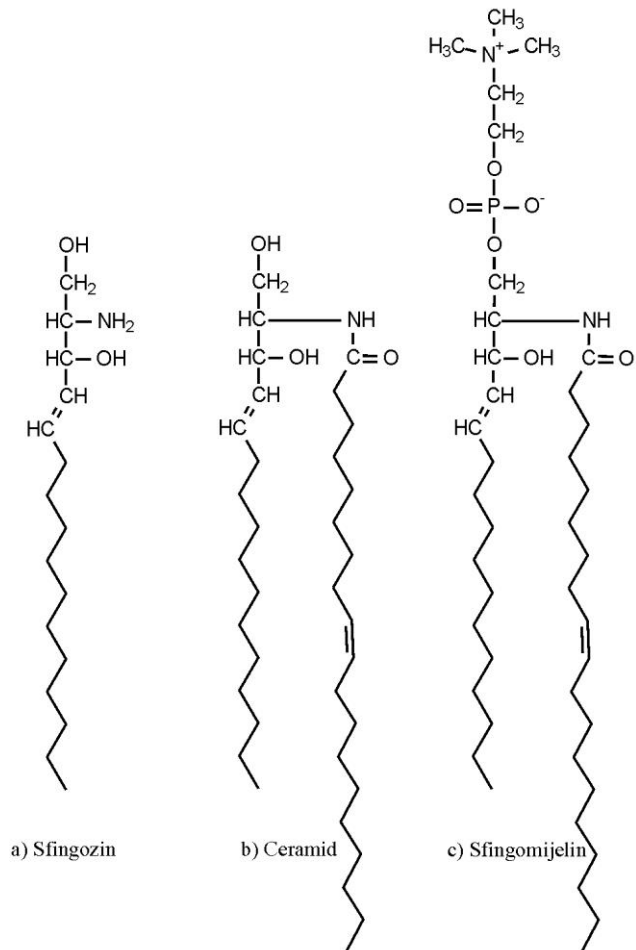


SFINGOZIDI (SFINGOLIPIDI)

Sfingozidi se sastoje iz aminoalkohola sfingozina, masne kiseline, fosfata i nekog polarnog molekula (npr. holin).

Amfipolarni molekuli.

U sastavu membrana Švanovih ćelija (sfingomijelin).



STEROIDI

Steroidi sadrže karakteristično steroidno jezgro sačinjeno od četiri koncentzovana ugljenična prstena.

Veoma slabo polarni molekuli.

U sastavu ćelijske membrane, osnova građe žučnih kiselina steroidnih hormona i vitamina D.

Ne razlažu se u organizmu viših životinja.

