Jure Stojan
7. predavanje

Primeri delovanja alosteričnih proteinov in encimov

Hb, PFK, PK, ATC

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$$

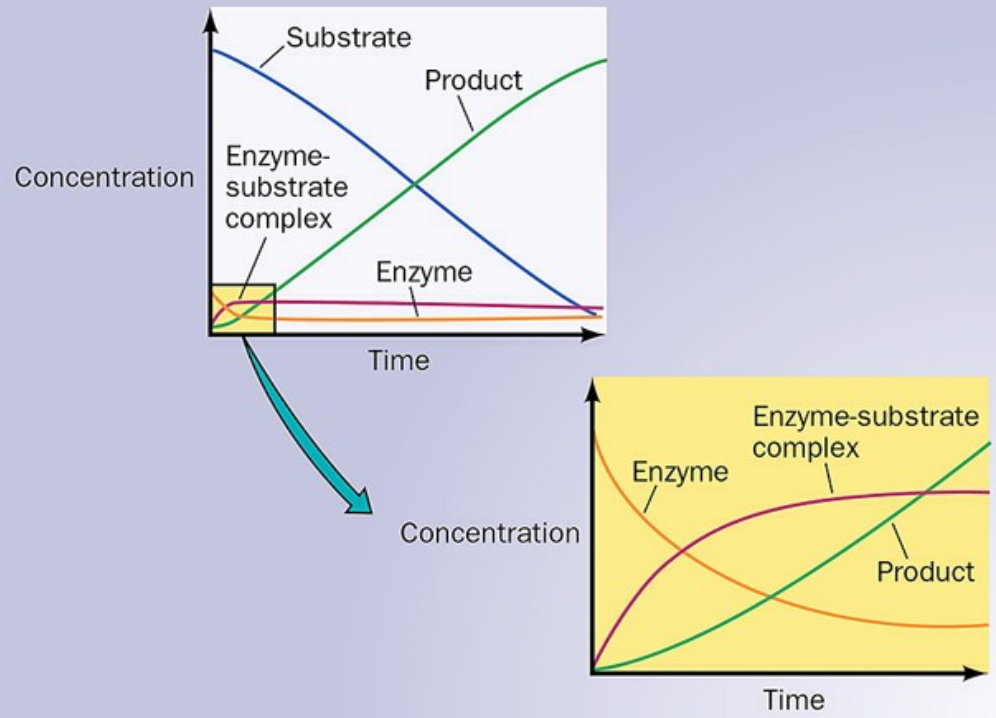
$$\frac{\Delta[ES]}{\Delta t} = k_1[E][S] \qquad -\frac{\Delta[ES]}{\Delta t} = k_{-1}[ES] + k_2[ES]$$

$$\frac{\Delta[ES]}{\Delta t} = -\frac{\Delta[ES]}{\Delta t}$$

$$k_1[E][S] = k_{-1}[ES] + k_2[ES]$$

$$\frac{([E]_0 - [ES])[S]}{[ES]} = \frac{k_{-1} + k_2}{k_1} = K_m$$

Steady state kinetics



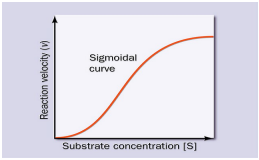
Stacionarno stanje

Alosterični pojavi

1 alosterija: v sistemu iz podenot poteka kontrola funkcije z drugega mesta

2 kooperativnost: sistem je sposoben vplivati sam nase

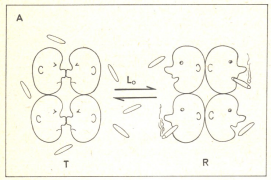
3 kinetika: sigmoidna krivulja v:[S]



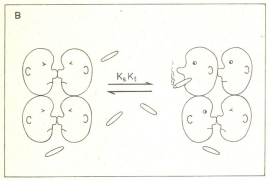
4 matematična formulacija: $v = \frac{V_{MAX}[S]^n}{[S]^n + K}$

5 molekulski modeli:

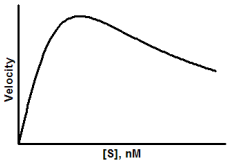
sočasni MWC

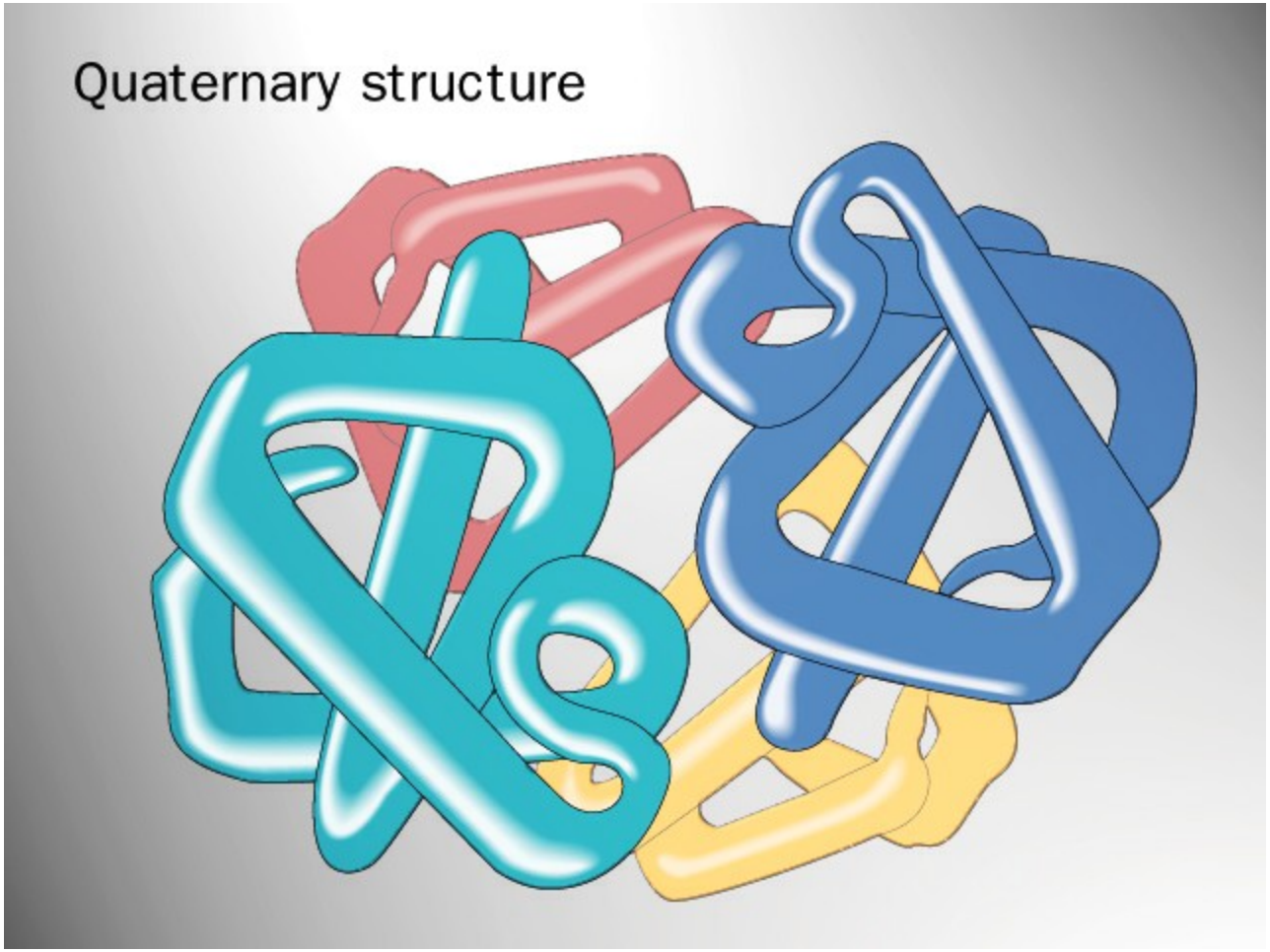


zaporedni AKNF

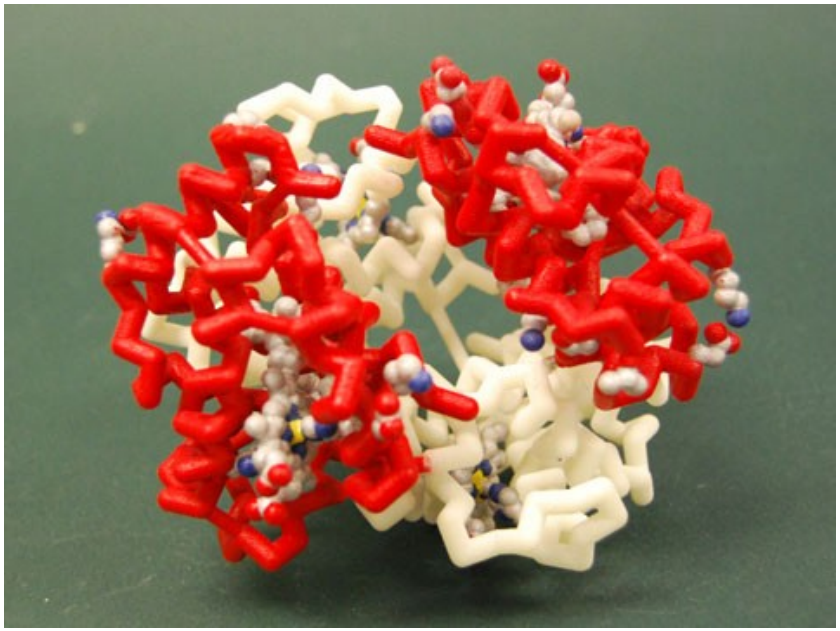


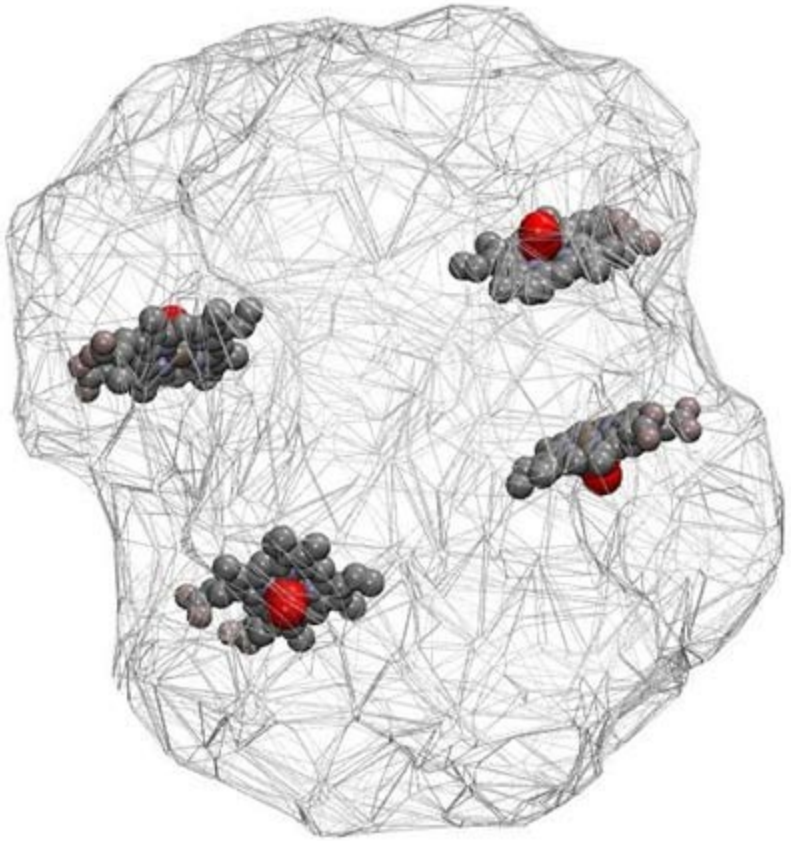
6 psevdo-kooperativnost: sistem ni iz podenot




Quaternary structure

Hemoglobin - Hb

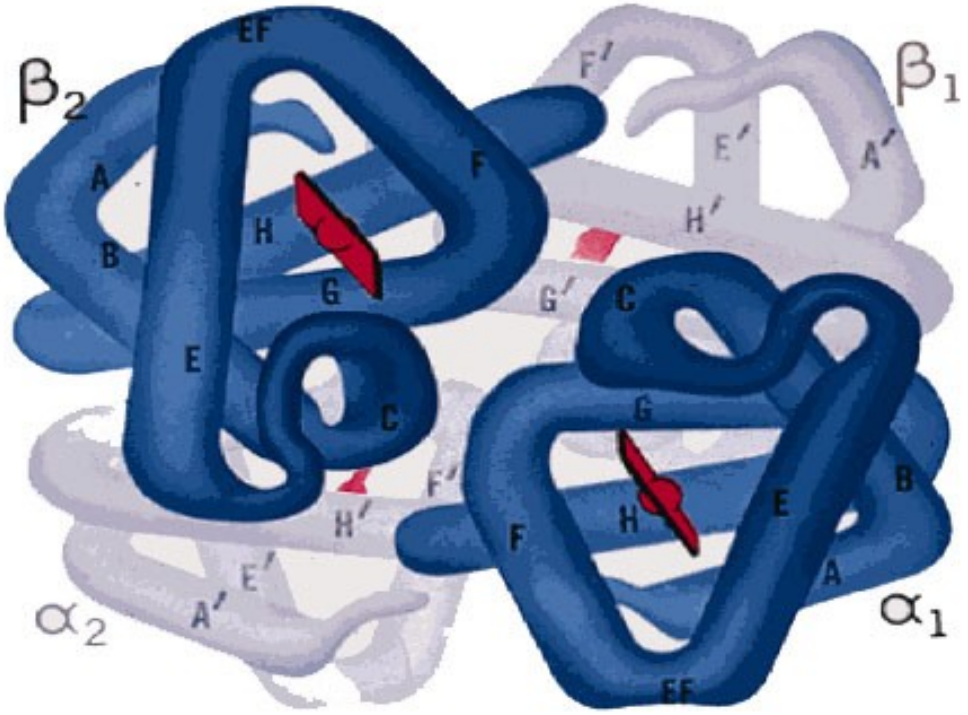




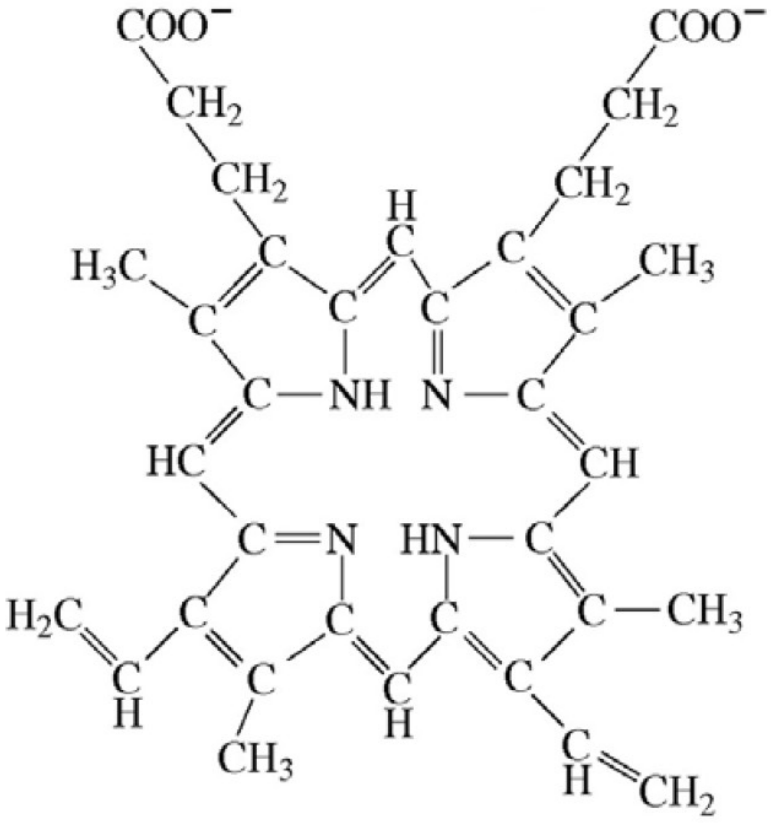
Heterotetramer
Transportna beljakovina

$$Hb + 4\ O_2 \rightleftharpoons Hb(O_2)_4$$

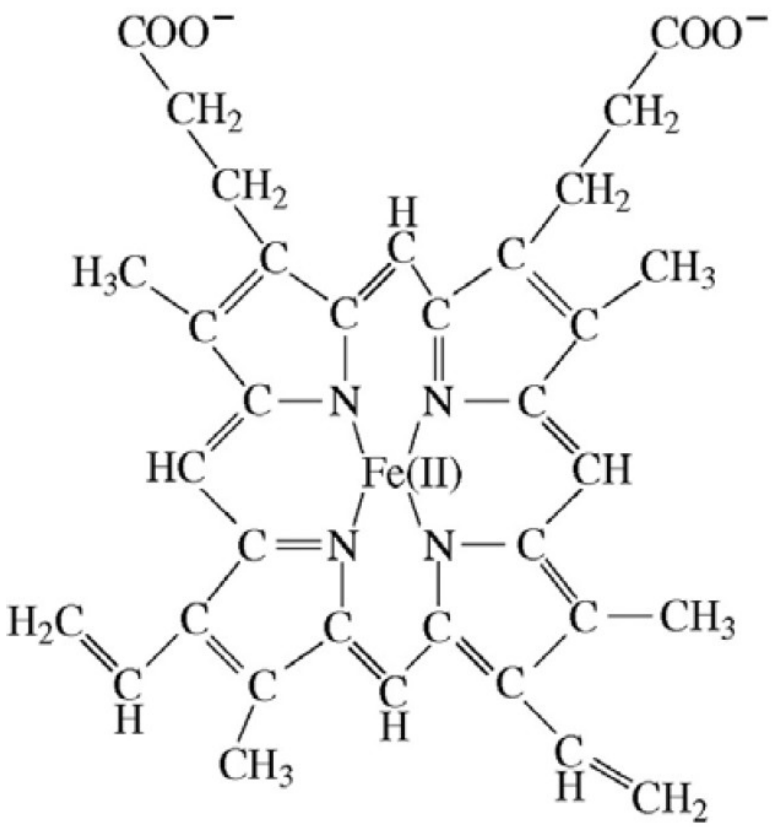
Hemoglobin - Hb



Hemoglobin - Hb

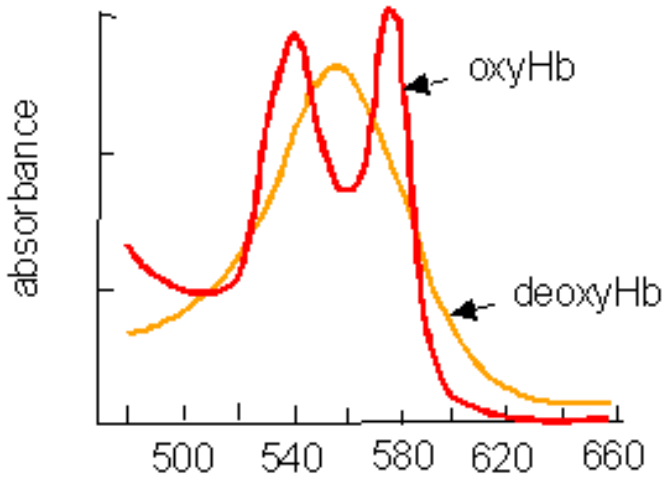


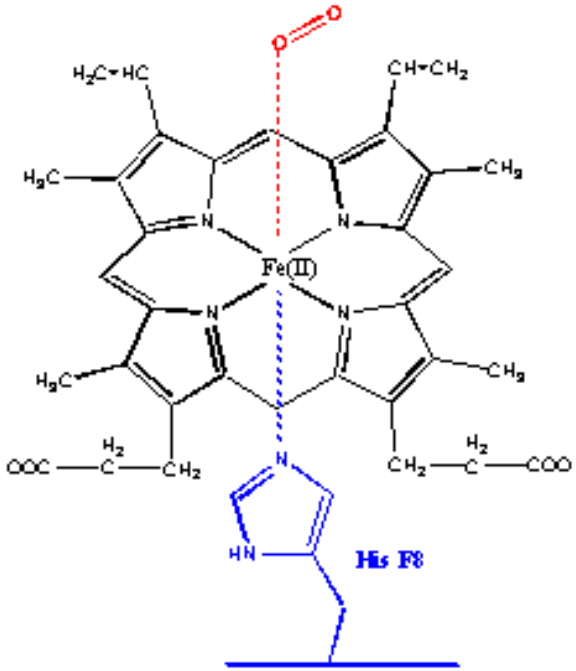
(a) protoporfirin IX



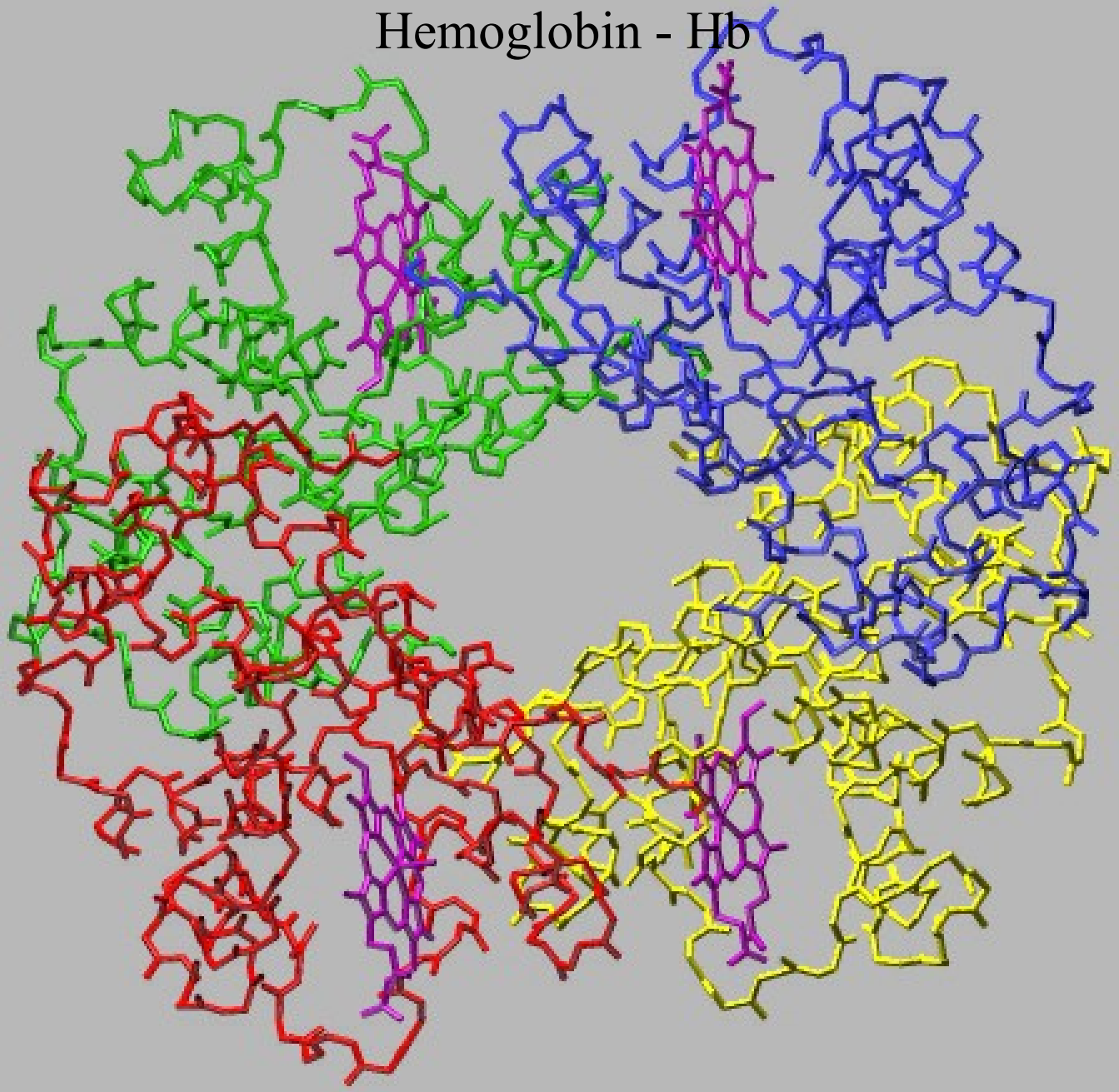
(b) hem (Fe-protoporfirin IX)

Hemoglobin - Hb

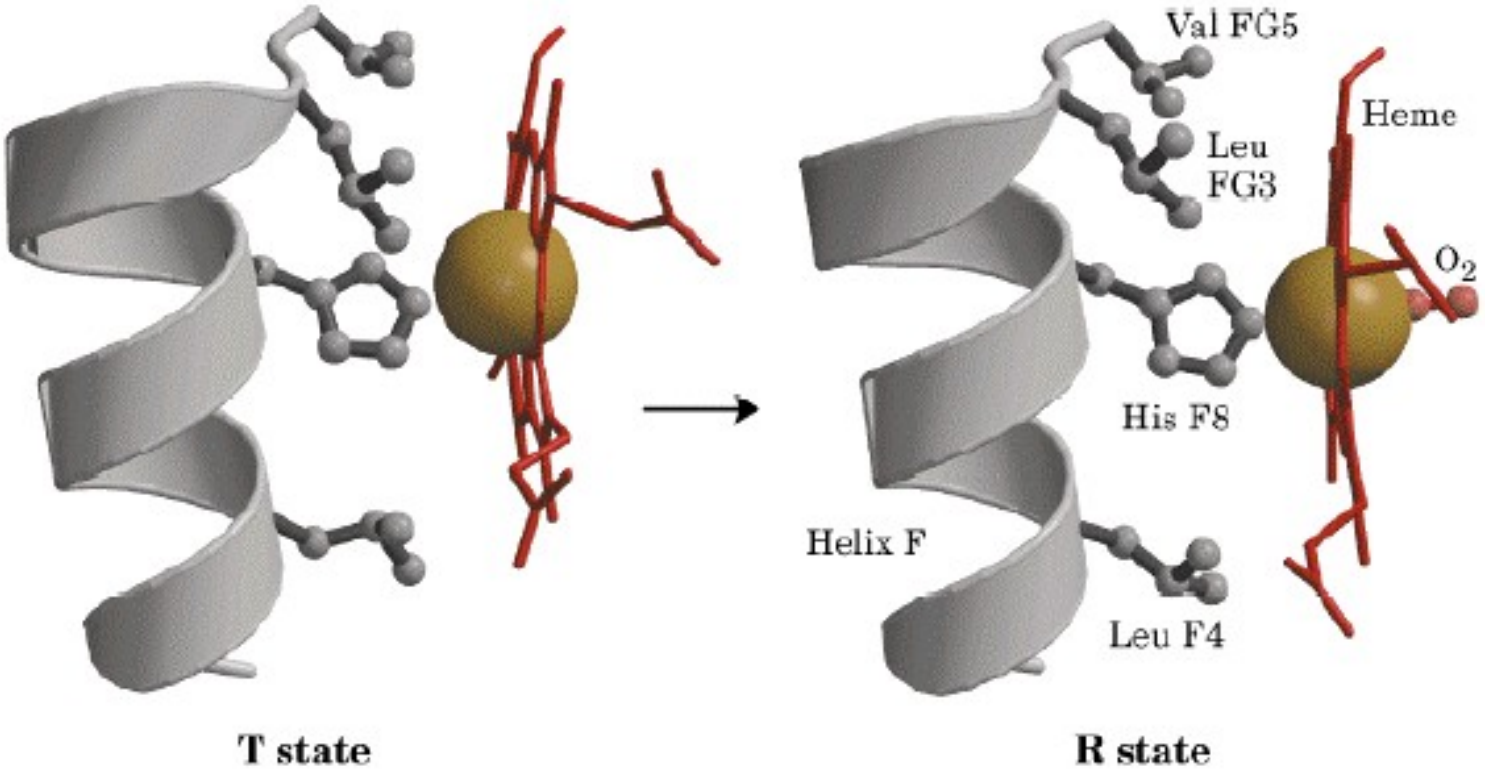




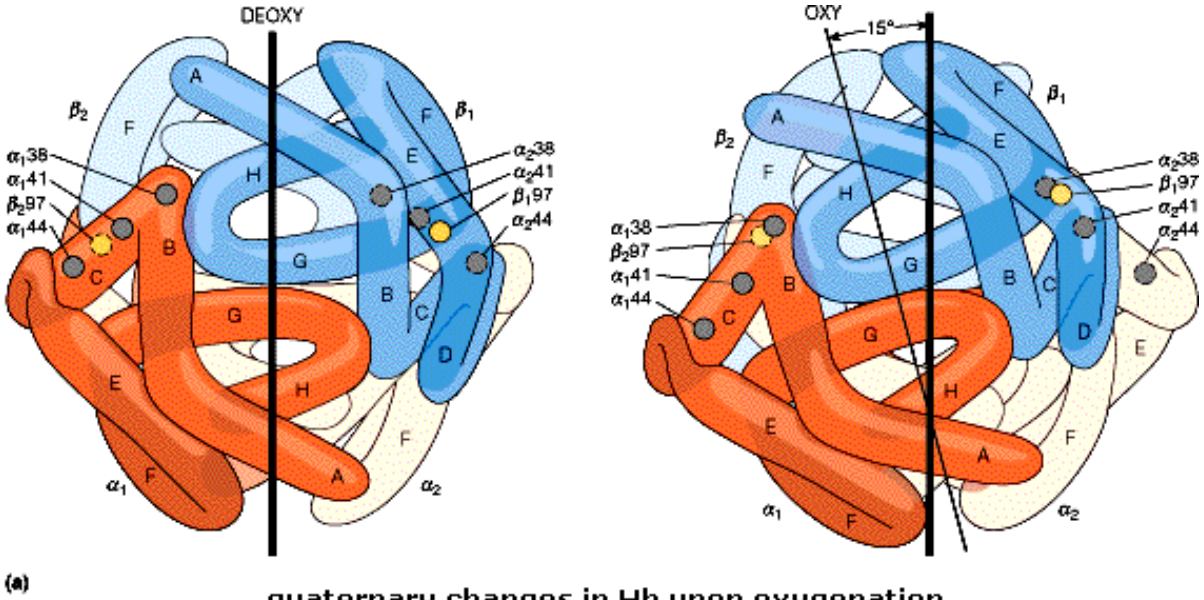
Hemoglobin - Hb



Hemoglobin - Hb

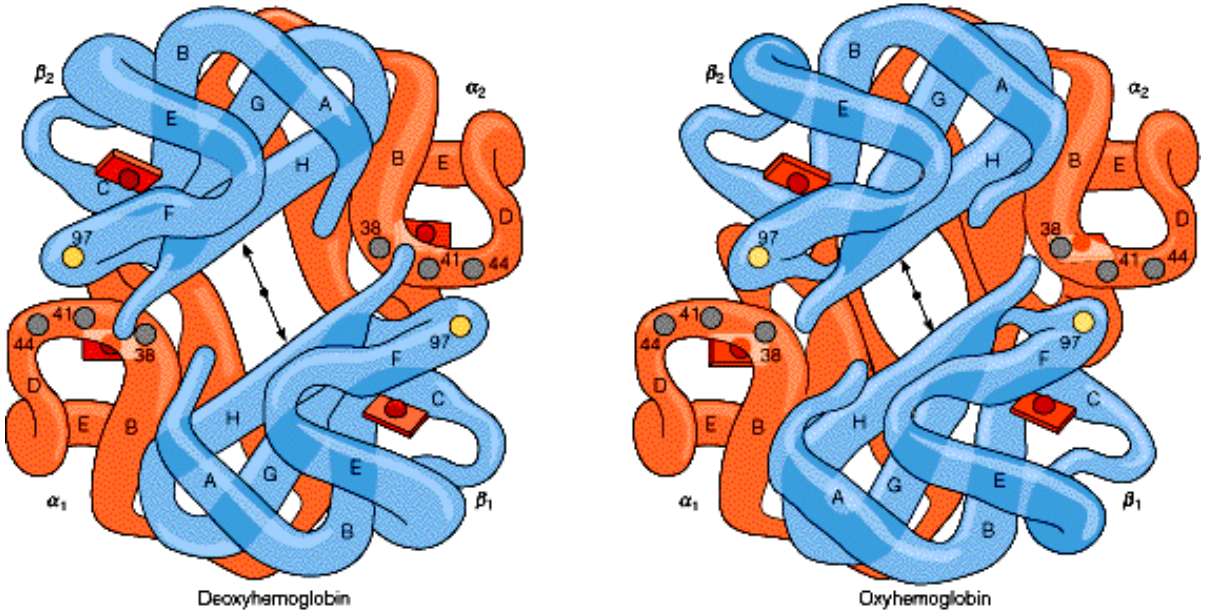


Hemoglobin - Hb



(a)

quaternary changes in Hb upon oxygenation



Deoxyhemoglobin

Oxyhemoglobin

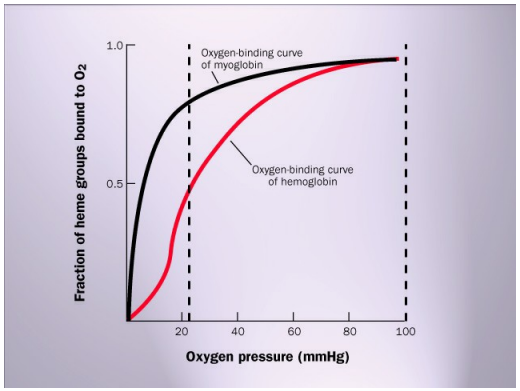
(b)

Hemoglobin - Hb

$$Hb + O_2 \overset{K_1}{\rightleftharpoons} Hb(O_2)$$
$$Hb(O_2) + O_2 \overset{K_2}{\rightleftharpoons} Hb(O_2)_2$$
$$Hb(O_2)_2 + O_2 \overset{K_3}{\rightleftharpoons} Hb(O_2)_3$$
$$Hb(O_2)_3 + O_2 \overset{K_4}{\rightleftharpoons} Hb(O_2)_4$$

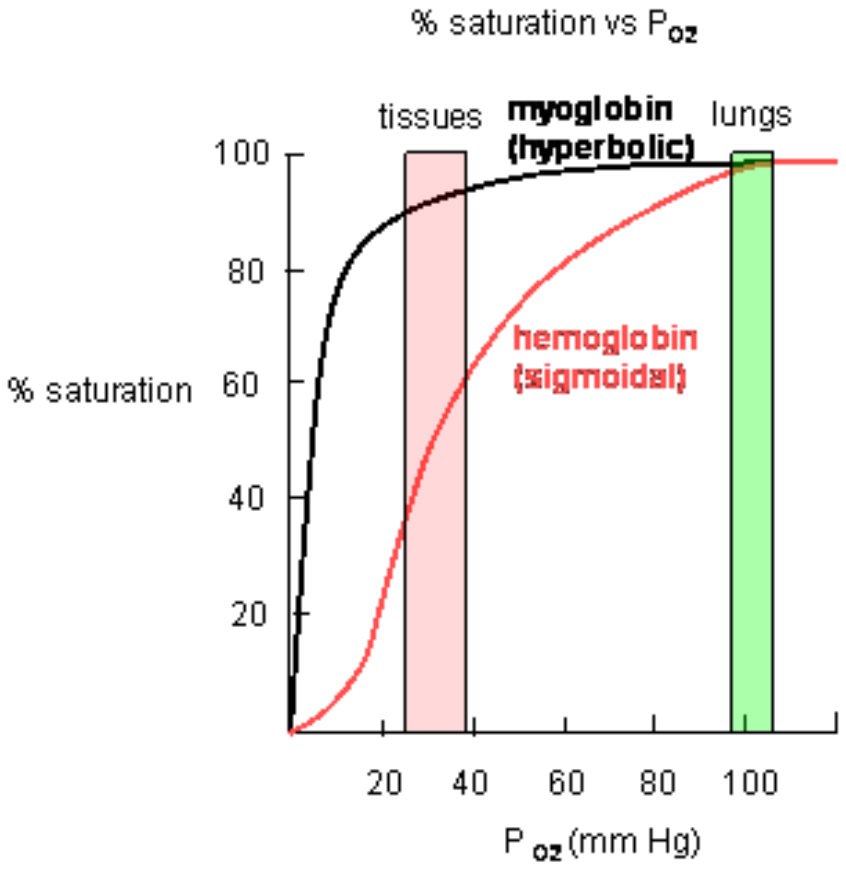
Adair-ova enačba

$$Y = \frac{K_1 X + 2K_1K_2(O_2)^2 + 3K_1K_2K_3(O_2)^3 + 4K_1K_2K_3K_4(O_2)^4}{4\left(1 + K_1(O_2) + K_1K_2(O_2)^2 + K_1K_2K_3(O_2)^3 + K_1K_2K_3K_4(O_2)^4\right)}$$

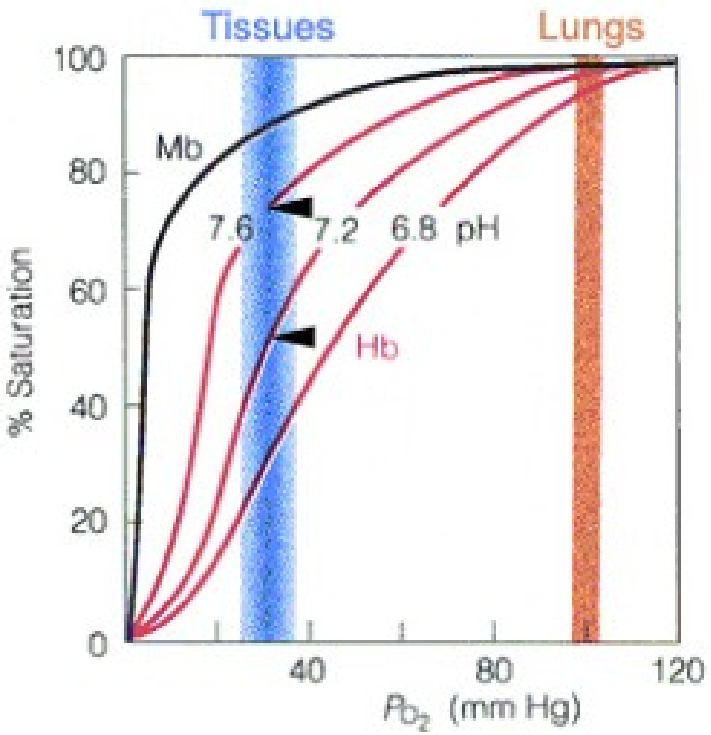


$$v = \frac{V_{MAX}[S]^n}{[S]^n + K} \longrightarrow y = \frac{A[O_2]^n}{B + [O_2]^n}$$

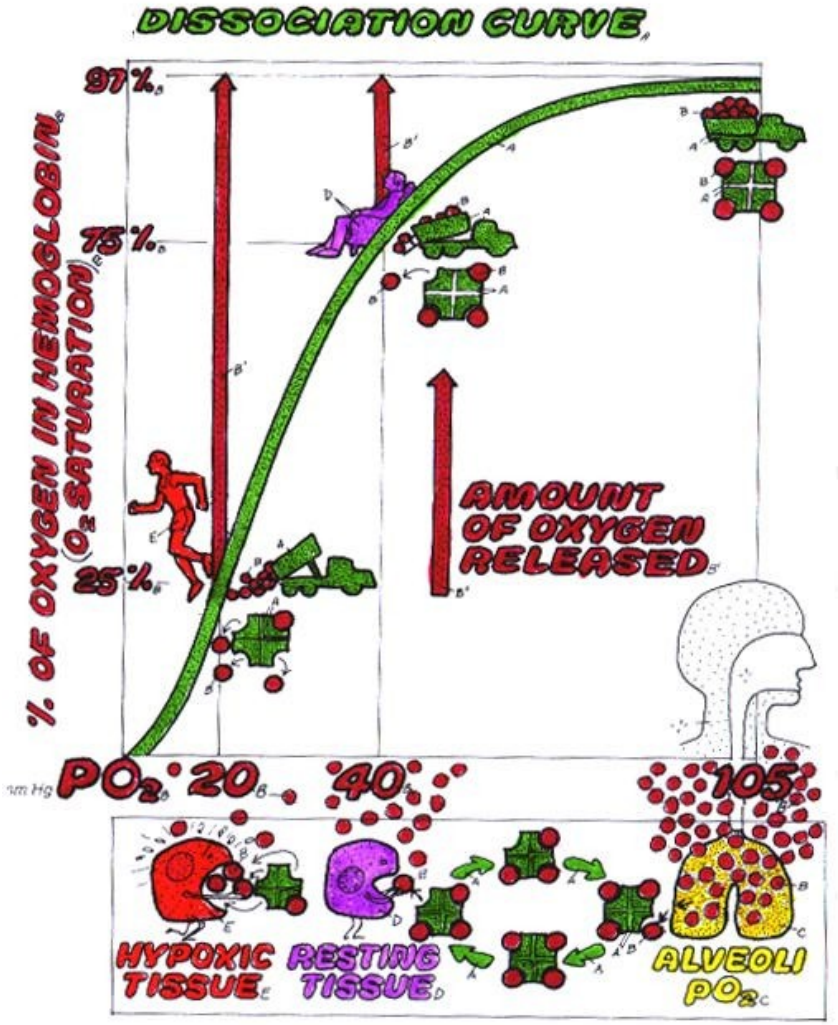
Hemoglobin - Hb

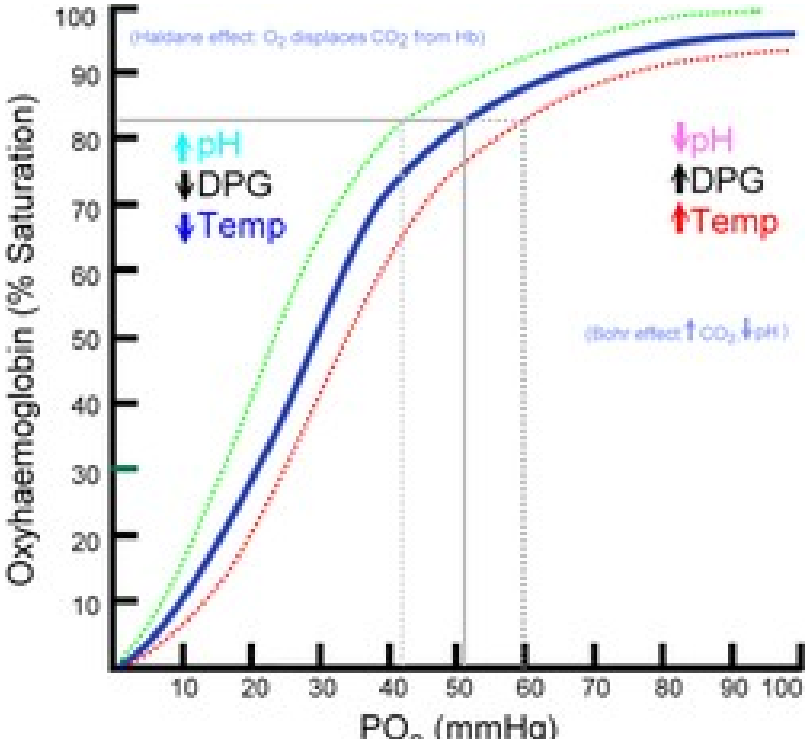


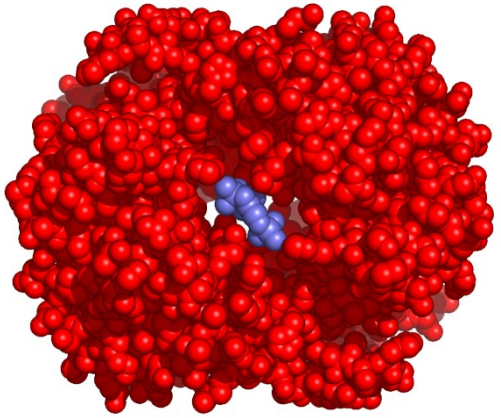
Vpliv pH na vezavo kisika - Bohrov efekt



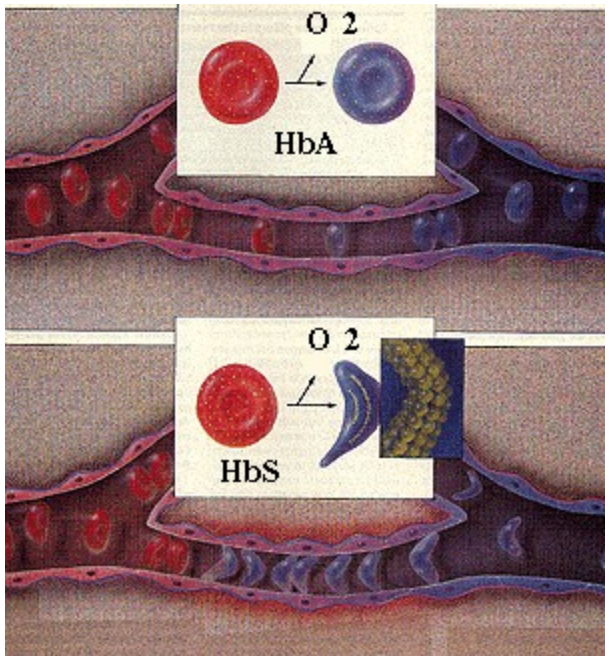
Hemoglobin - Hb

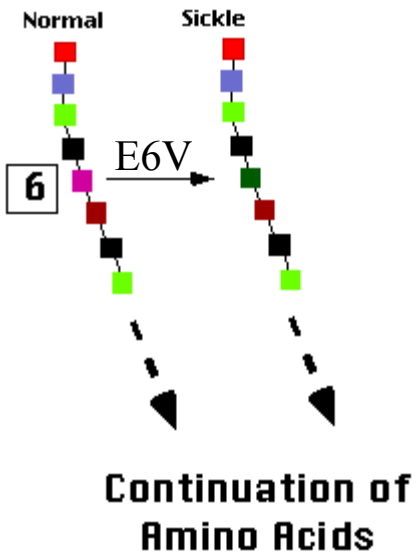




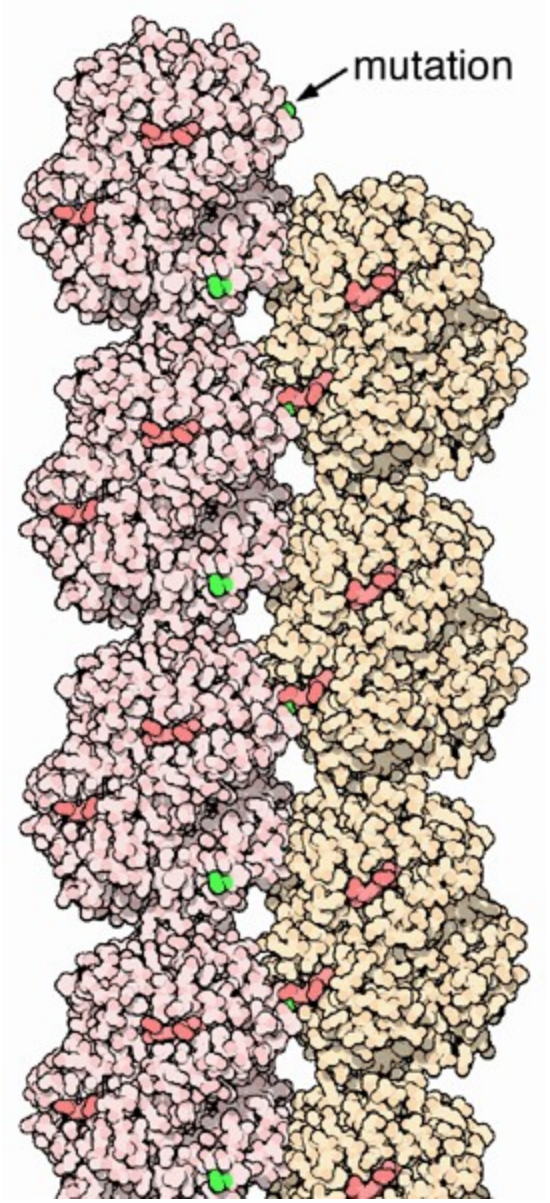


Hemoglobin - Hb

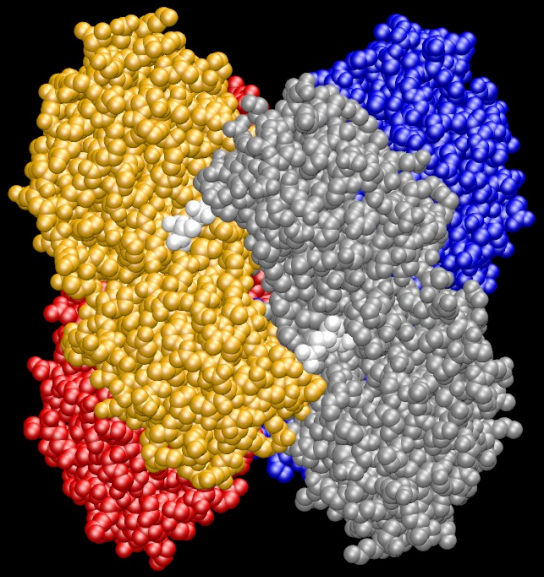




Srpasta anemija

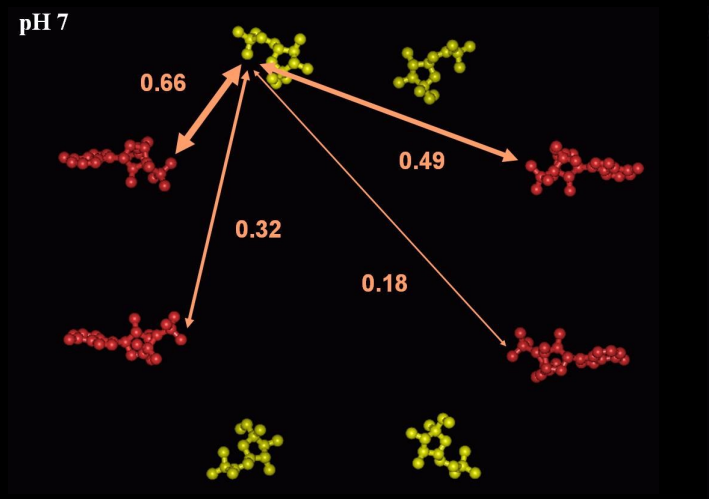


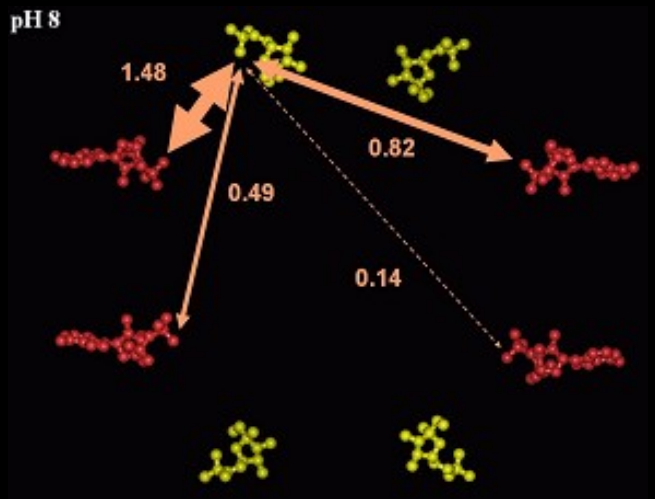
Fosfofruktokinaza - PFK1



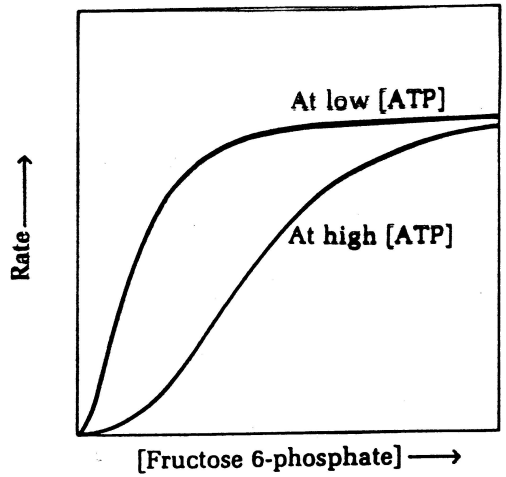
PDB koda 1MTO: homodimer dimerov

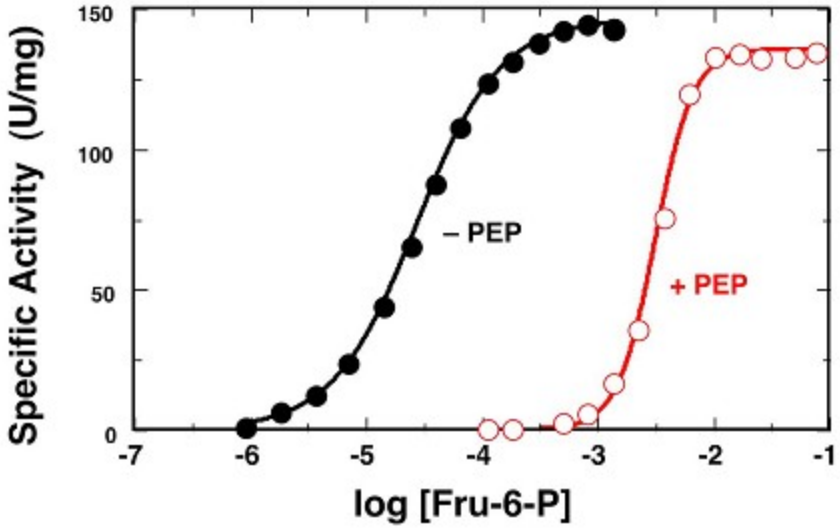
Fruktoza-6-P ⟶ Fruktoza-1,6-biP

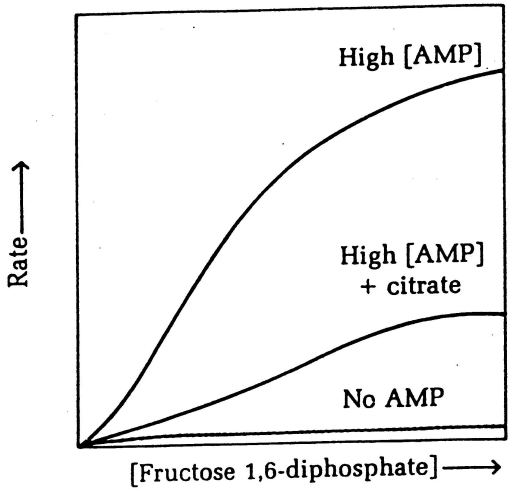




Fosfofruktokinaza - PFK1





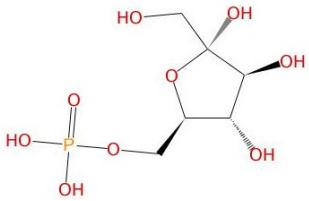


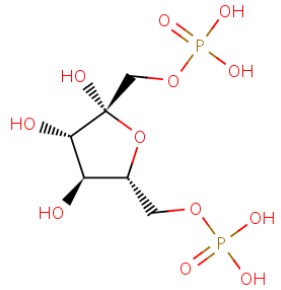
ATP, PEP, Citrat

Fruktoza-6-P ⇌ Fruktoza-1,6-biP

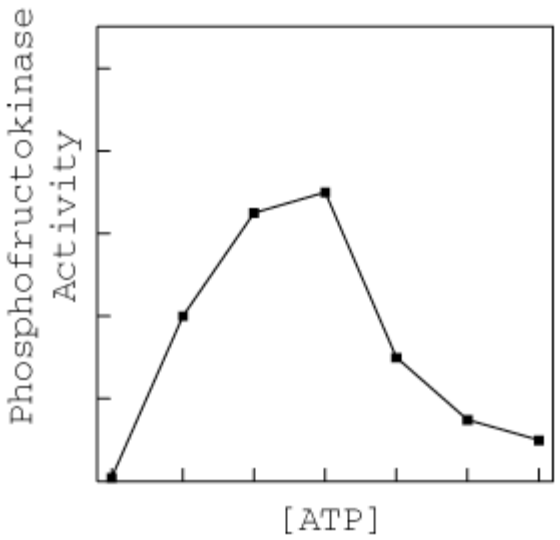
+++

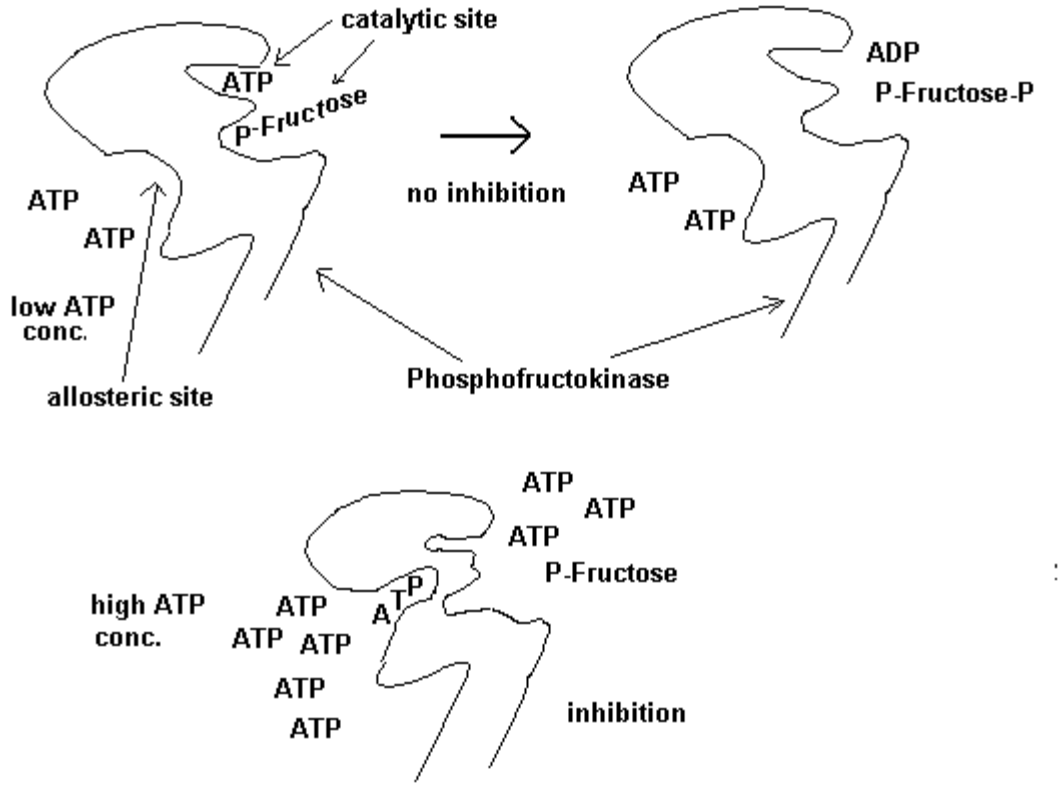
AMP, F-2,6 bi P



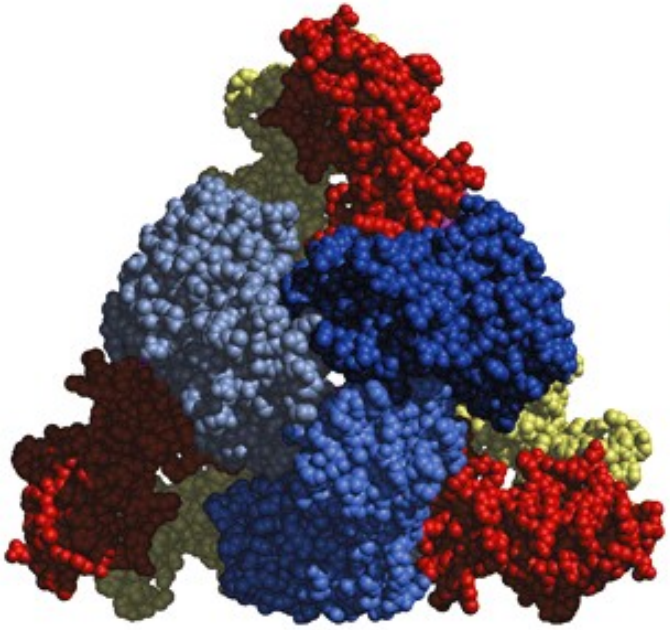


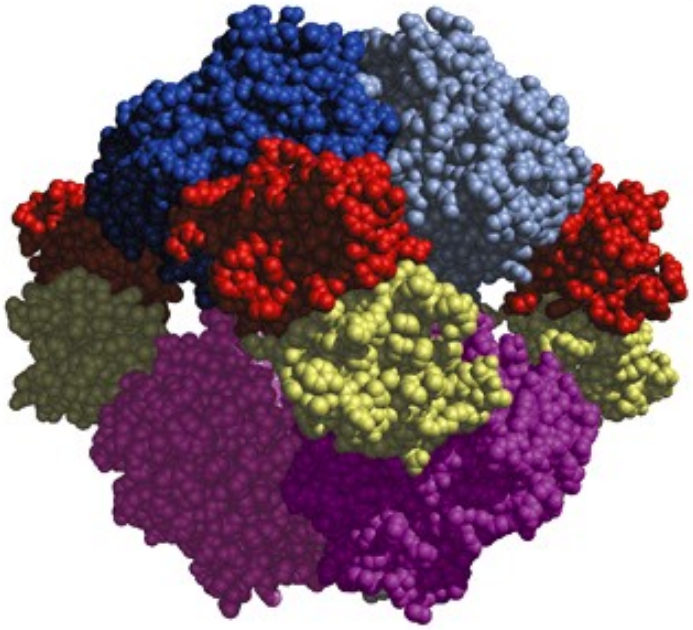
Fosfofruktokinaza - PFK1

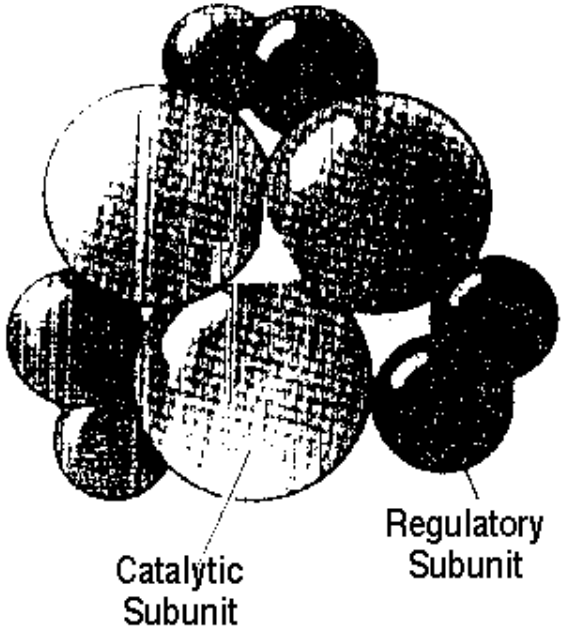


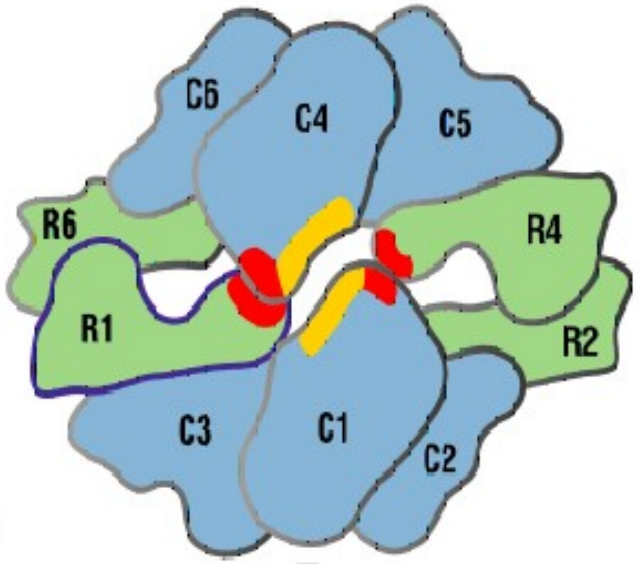


Aspartat transkarbamoilaza - ATC

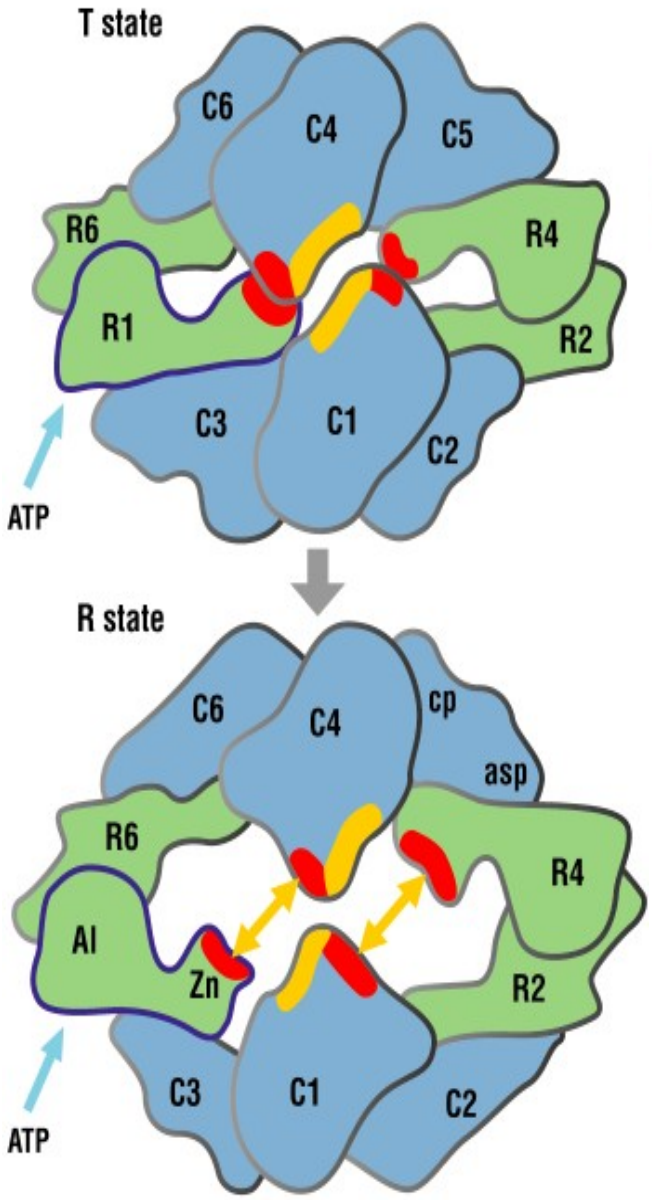


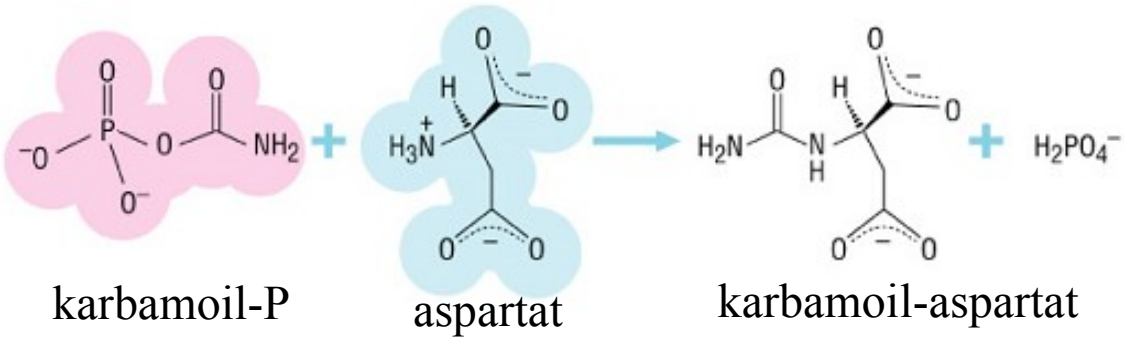


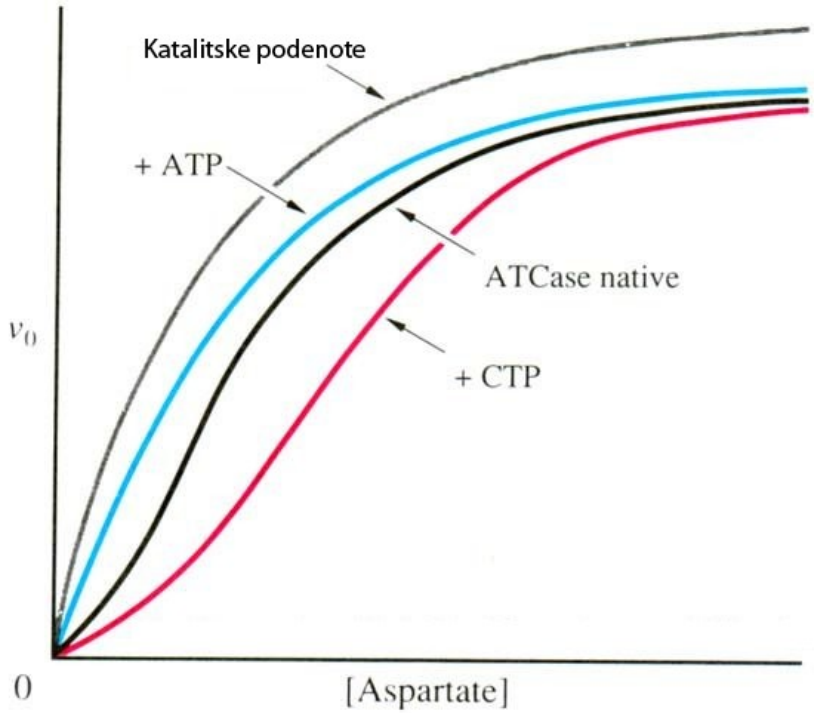




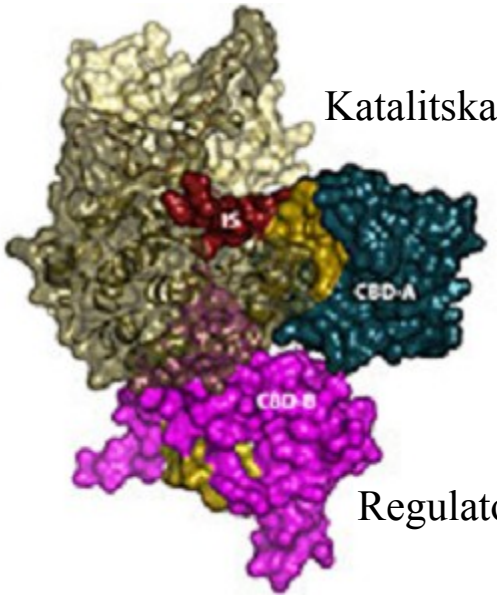
Aspartat transkarbamoilaza - ATC





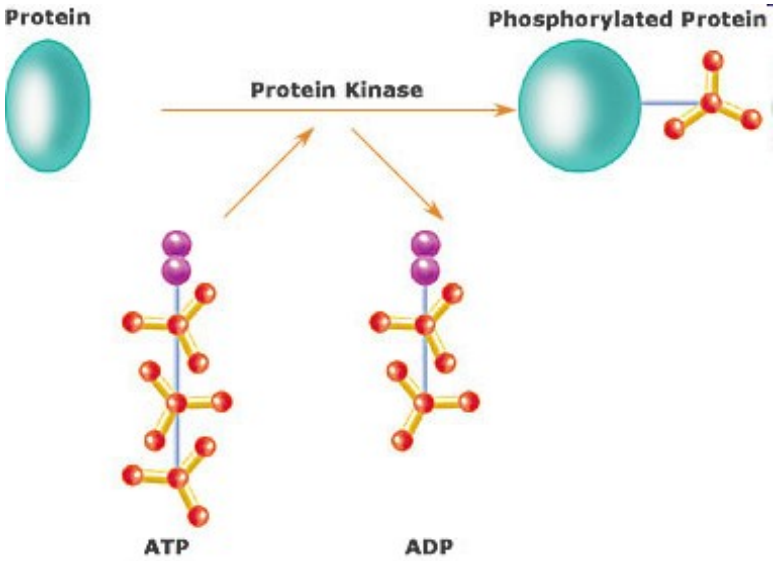


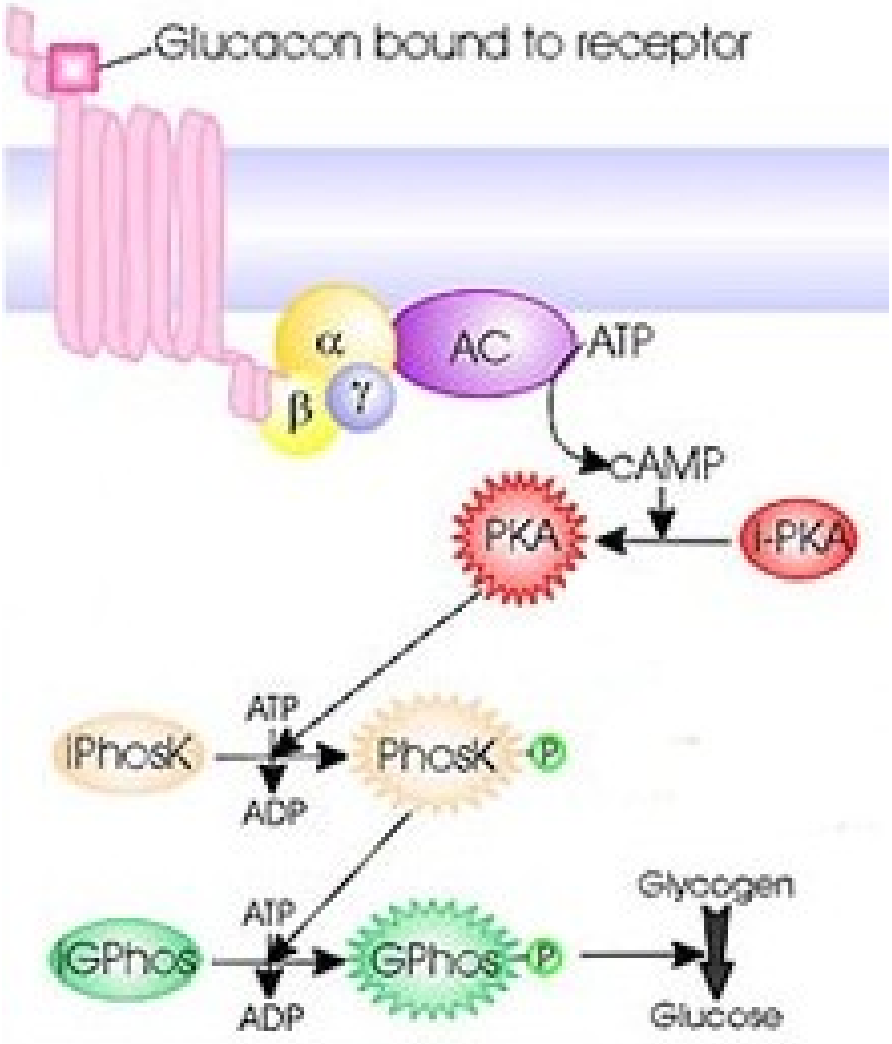
Proteinska kinaza - PK



Katalitska podenota

Regulatorna podenota

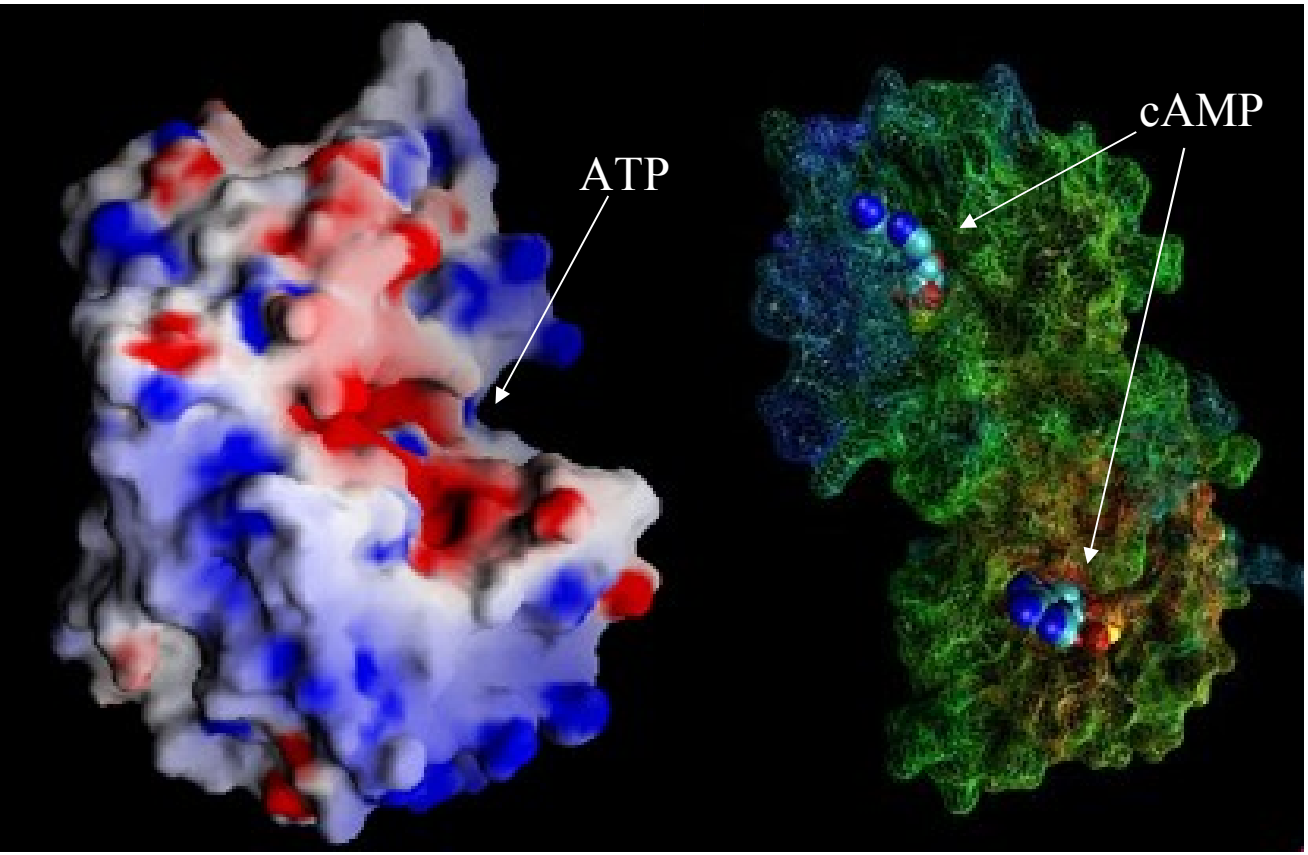


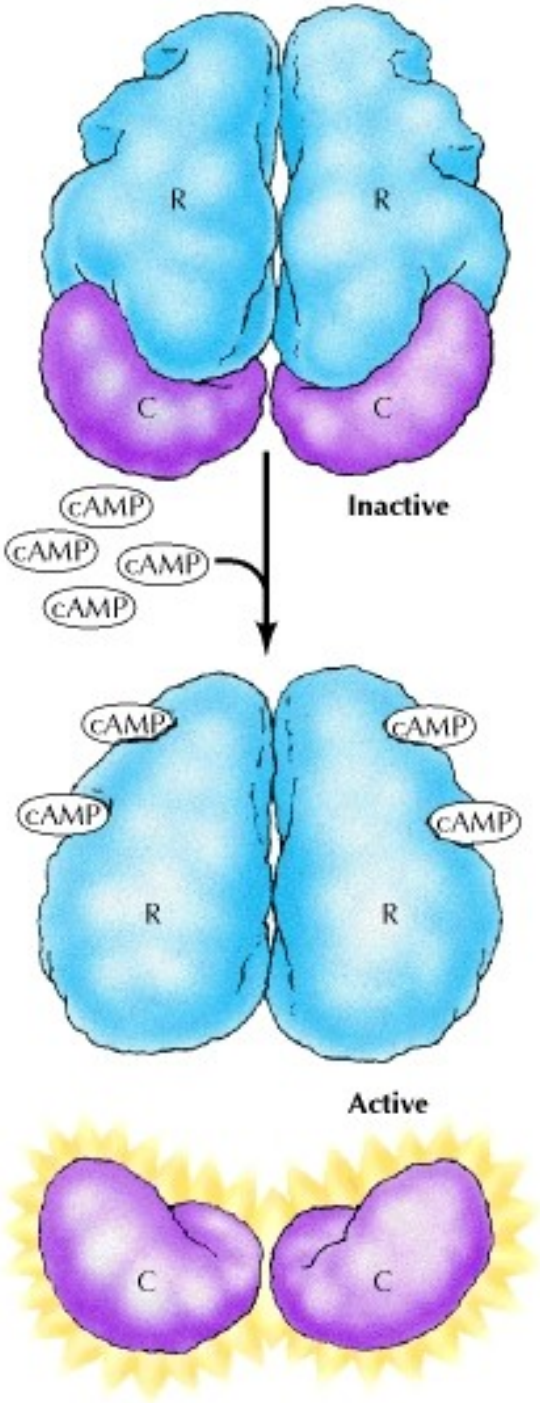


Proteinska kinaza - PK

Katalitska podenota

Regulatorna podenota



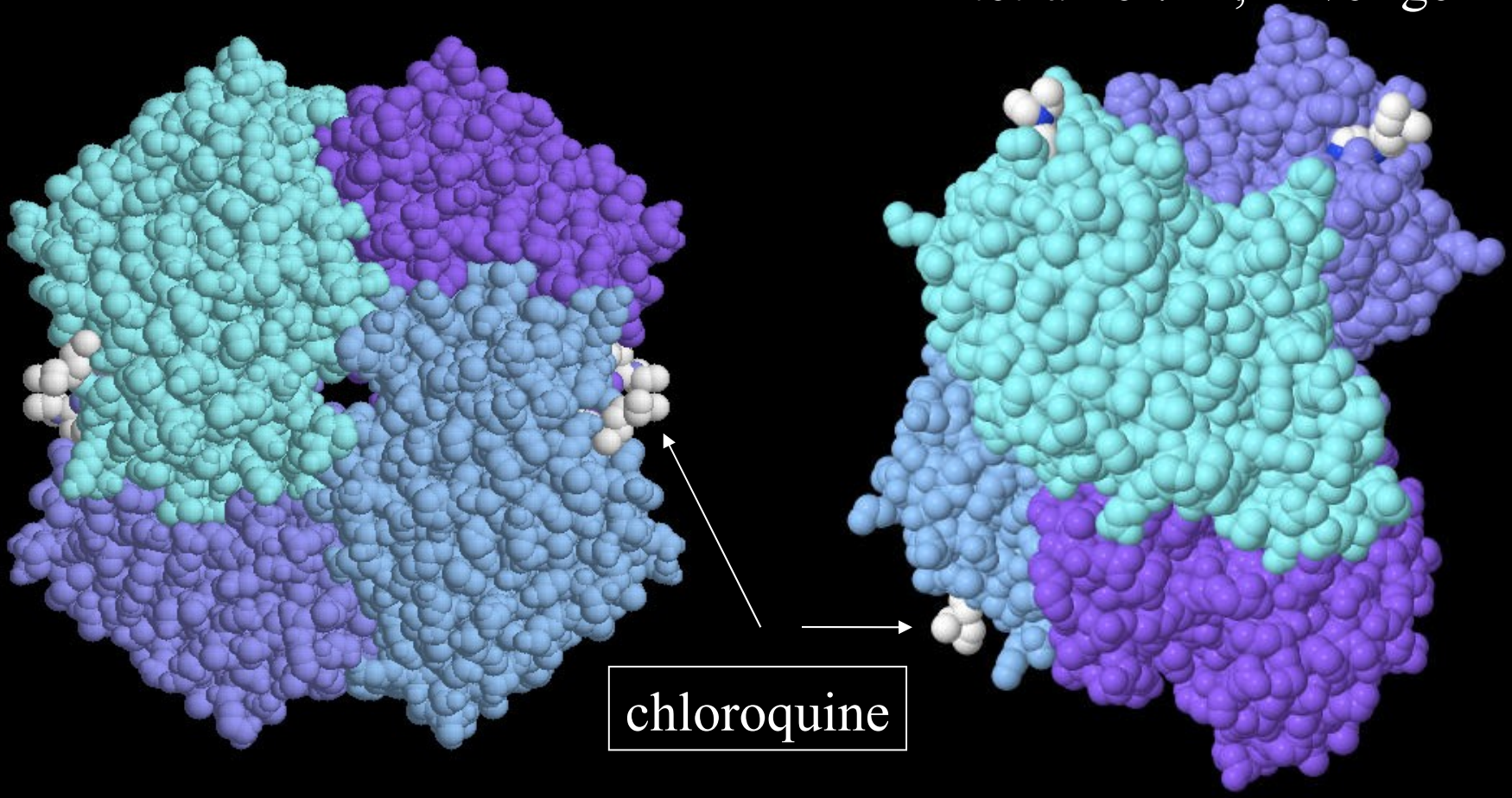


Laktat dehidrogenaza

Piruvat ⟷ Laktat

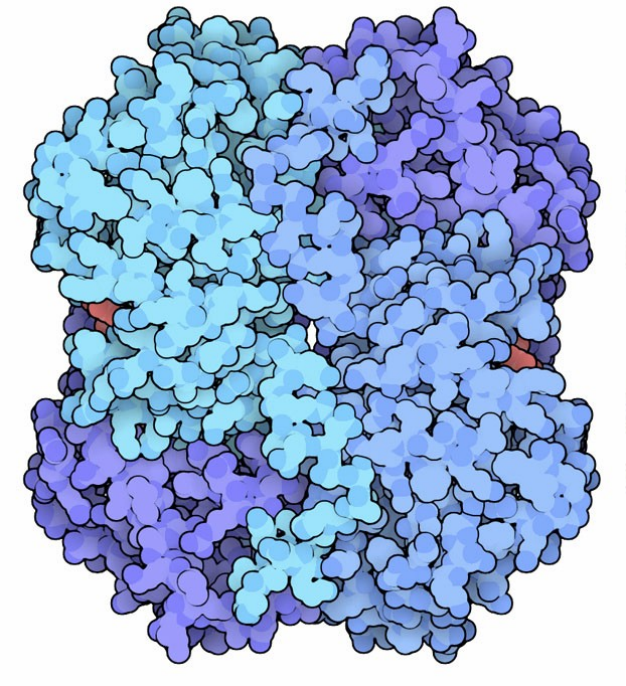
PDB koda: 1CET, P. malariae

tetramer: M, H verige



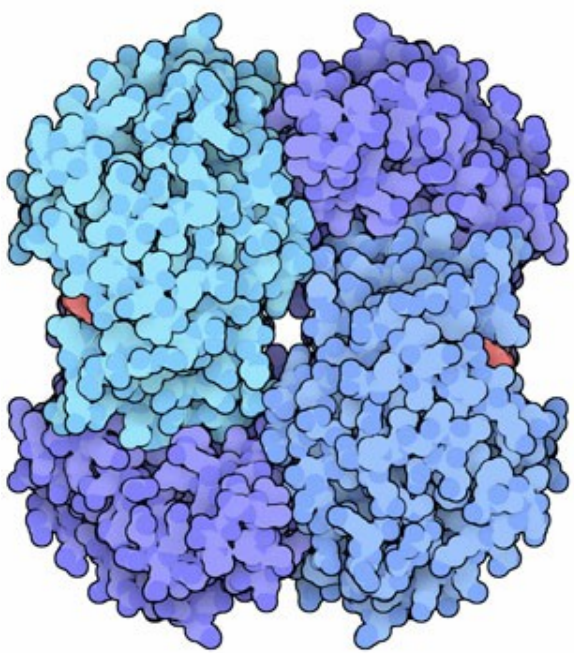
Laktat dehidrogenaza

PDB koda: 3LDH, M tetramer

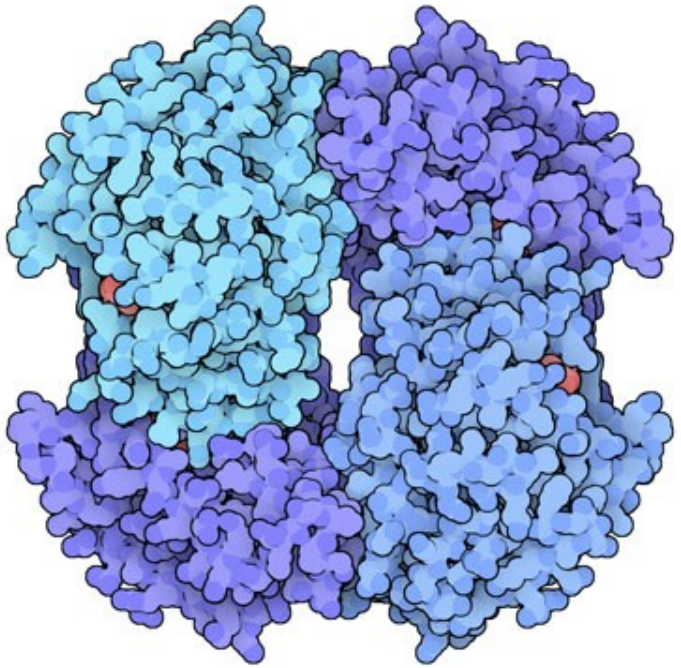


Aktivna oblika

PDB koda: 1LDH, M dimer + H dimer



Aktivna oblika

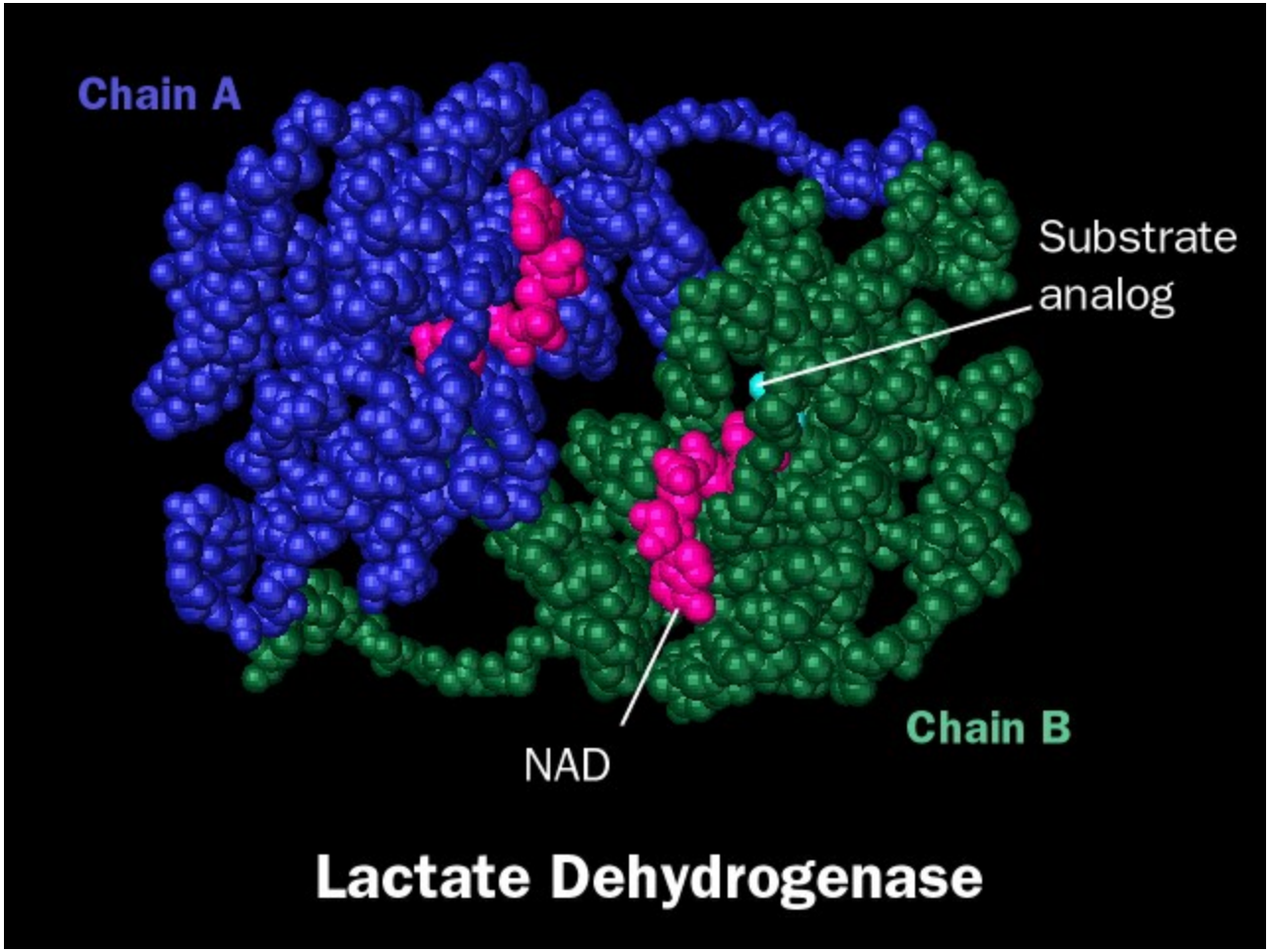


Neaktivna oblika

Fruktoza 1,6 bi fosfat

Piruvat $\overset{+++}{\rightleftharpoons}$ Laktat

Laktat dehidrogenaza



Matjaž Zorko
8. predavanje

Klasifikacija encimov

Primeri delovanja predstavnikov različnih encimskih razredov