Chem 452 - Lecture 3
Hemoglobin & Myoglobin
111007

Hemoglobin (Hb) and Myoglobin (Mb) function as oxygen transport and storage molecules in higher organisms. There functions have been long studied and, together, provide a wealth of examples of how the structure and function of proteins are related.

Allosteric Regulation

- Other allosteric regulators include
  - H^+ (lower pH) - The Bohr Effect
  - CO_2
- Both of these metabolites signal increased metabolic activity

Allosteric Regulation

- Othe
  - H^+ (
  - CO_2
- Both
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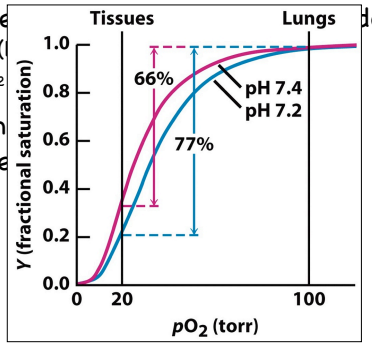

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Chem 452, Lecture 3 - Hb and Mb 2

Allosteric Regulation

- Lower pH leads to the formation of salt-bridges (charge/charge interactions), that stabilize the T-state.
  - α-chain α-amino group
  - β-chain H146
  - α-chain H122

Allosteric Regulation

- Lower
  - α-cha
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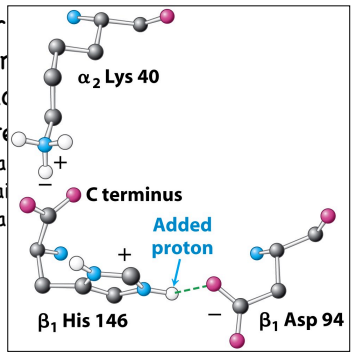

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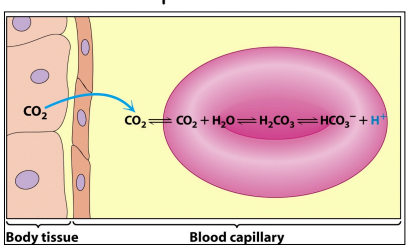
Chem 452, Lecture 3 - Hb and Mb 3

Allosteric Regulation

- CO_2 lowers Hb's affinity for O_2 by two different mechanisms.
  - It lowers the pH



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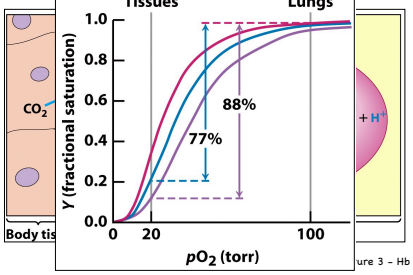

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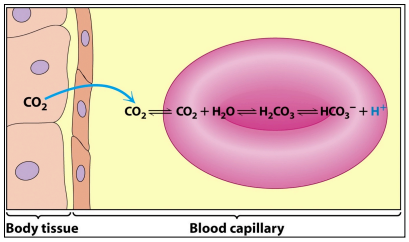

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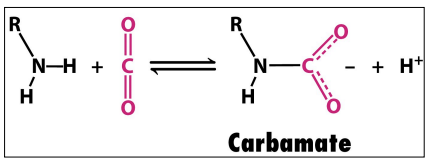

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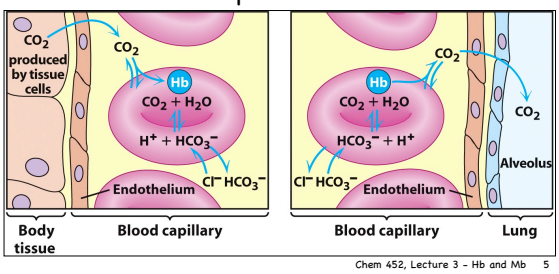

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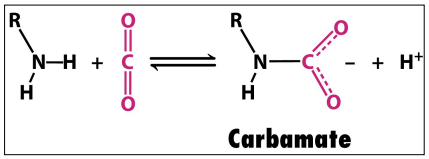


Genetic Diseases Involving Hb

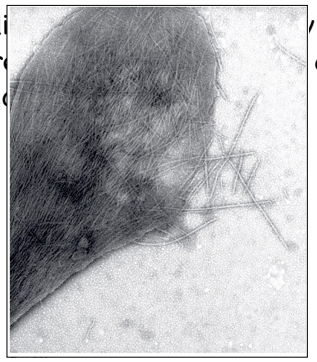
- Concept of diseases caused by molecular defect was proposed in 1949 by Linus Pauling
  - Sickle-cell Hb (Hb-S)

Genetic Diseases Involving Hb

- Sickling of RBC's is caused by the aggregation (polymerization) of Hb molecules.

Genetic Diseases Involving Hb

- Sickli / the aggr of Hb mole



Genetic Diseases Involving Hb

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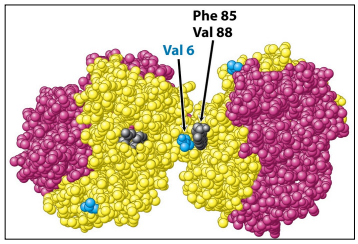
Genetic Diseases Involving Hb

- Disease is caused by a substitution of a Val for a Glu at position 6 in the β-chain (E6V)



Genetic Diseases Involving Hb

- Sickle-cell disease is **homozygous recessive**.
- **Heterozygous** individuals do not express the disease
  - However, they are more resistant to the malaria parasite (Plasmodium falciparum)

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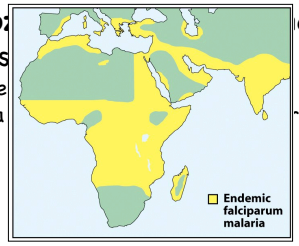

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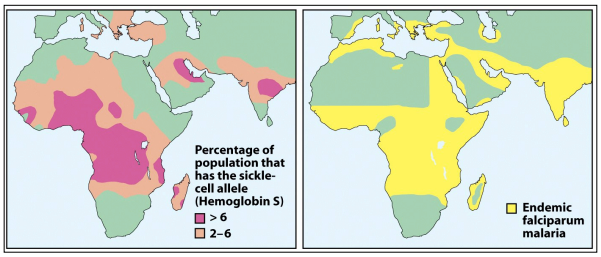

Next up

- Enzymes (Chapter 8)