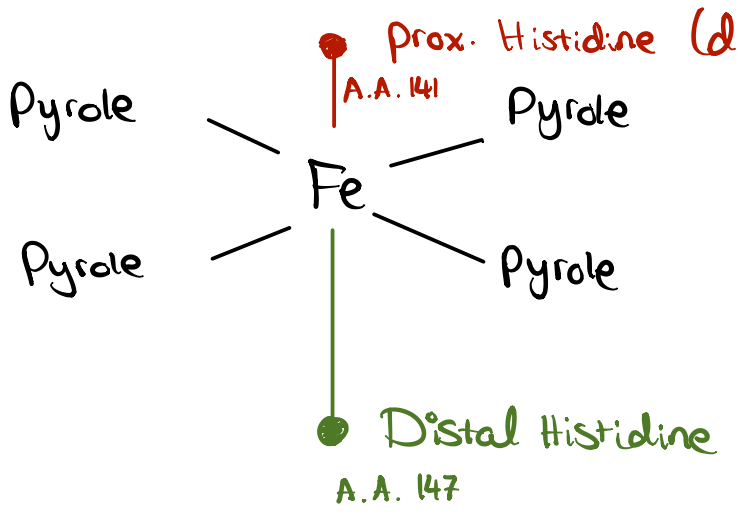
Hemo Proteins = Protein + Heme Group

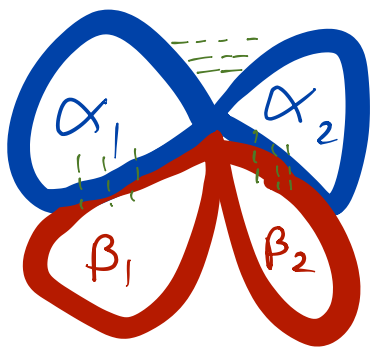
Heme Group = ProtoPorphyrin IX + Fe^{2+}

Porphyrin = 4 Pyrole rings (A ⟶ D)

Per 2 Pyrole Rings = 1 Propianate group ∴ 4 Pyrolle rings (1 Heme) = 2 propionates



Heme is Globular, so Consists of Quaternary Structure (4 Subunits, 2α and 2β) first A.A. in both α and B is Valine



$\alpha_1\beta_1 = \alpha_2\beta_2$

ionic & Hydrogen forces exist b/w the subunits

Hb has 2 states:

Tense (T)	Relaxed (R)
DeOxygenated	Oxygenated
* X O_2 bound to Subunits * Hb is already compact * forces b/w Subunits are strong w/ no way to relieve pressure	O_2 binds to Subunits O_2 "pulls" on proximal Histidine downwards ⇒ pressure relieved on Hb subunits as ionic and Hydrogen forces break forces stabilizing T state break

factors affecting Affinity

O_2 : Homotropic (same as ligand binding site) toward R state +ve cooperativity

CO_2 : Heterotropic (different from ligand) b/w R and T states

Cooperativity using Hill Model $n > 1$ +ve
$n = 0$ none
$n < 1$ -ve

Models ⇒ Concerted vs Sequential

Concerted	Sequential
only T or R state	Intermediate States exist b/w T and R
O_2 binding ↑ probability of T ⟶ R for each subunit	one at a time but each subunit takes less energy to be occupied (conformational change)

Hb forms

Embryo → Fetus → Birth → Adult

2 Epsilon (ε)
2 Zeta (ζ)

2 Alpha (α)
2 Gamma (γ)

60% 2 Alpha (α), 2 Gamma (γ)
40% 2 Alpha (α), 2 Beta (β)

99% 2 Alpha (α), 2 Beta (β)
1% 2 Alpha (α), 2 Gamma (γ)

Dominant

2ζ 2ε

2α 2γ HbF
V. high O_2 affinity

2α 2γ

2α 2β

2α 2β = HbA

HbA + Hexose Sugar {on Valine in β-sheets} = HbA_1c

	fasting Bld Sugar	HbA_1c	Random Sugar Test
	Short-term (%)	long-term Avg (mg/dL)	
Healthy	< 100	< 5.7	∅
Pre Diabetic	100 – 125	5.7 – 6.5	∅
Diabetic	> 125	≥ 6.5	> 200