

Modeling project: Oxygen binding to hemoglobin

Physics of Complex Systems M2 – Biophysics

Hemoglobin is a specialized protein that makes 96% of the red blood cells' dry content in mammals. Its role is to bind dioxygen to be transported through the blood flow. Each hemoglobin can bind one O_2 , and assembles into a tetramer whose structure is shown in Fig. 1. Figure 2 presents the oxygen binding isotherms for hemoglobin tetramers in solution as a function of oxygen partial pressure.

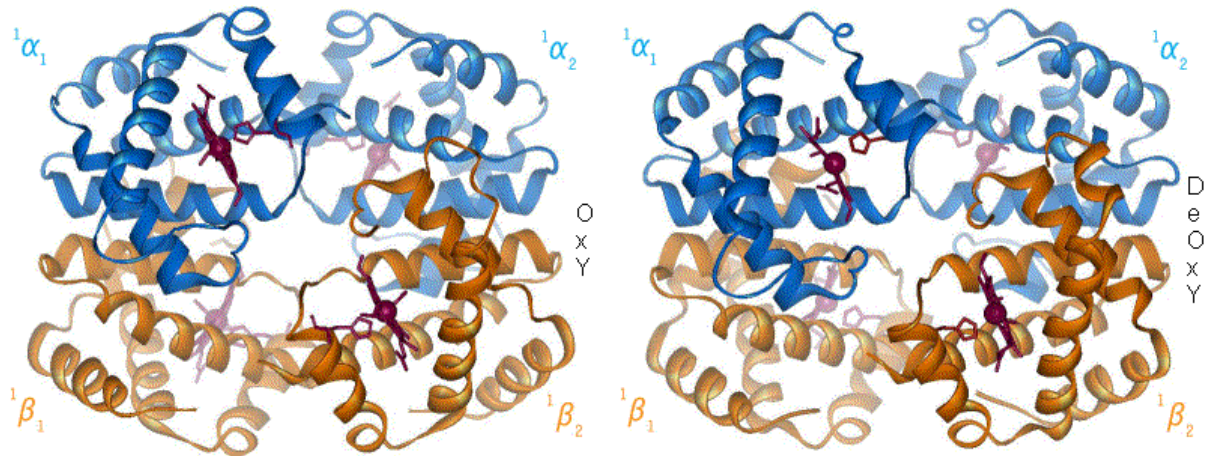


Figure 1: Structure of a human hemoglobin tetramer. Left: structure bound to four oxygens; right: structure without dioxygen bound. The dioxygens are carried by iron atoms bound to each protein subunit (small spheres)

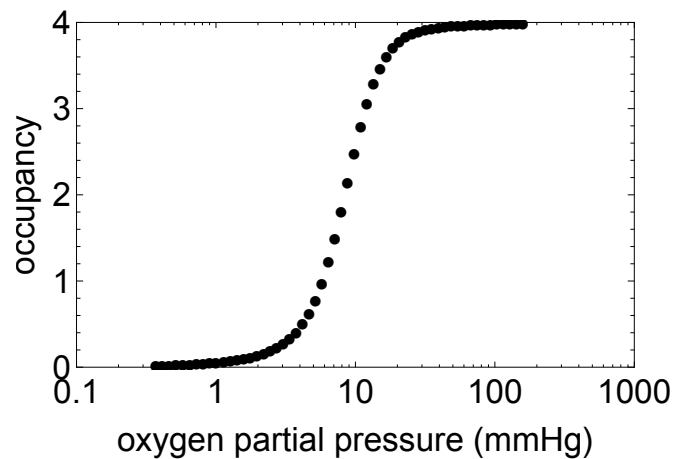


Figure 2: Average number of dioxygens bound to a hemoglobin tetramer as a function of oxygen partial pressure ($1 \text{ mmHg} \simeq 133.3 \text{ Pa}$).