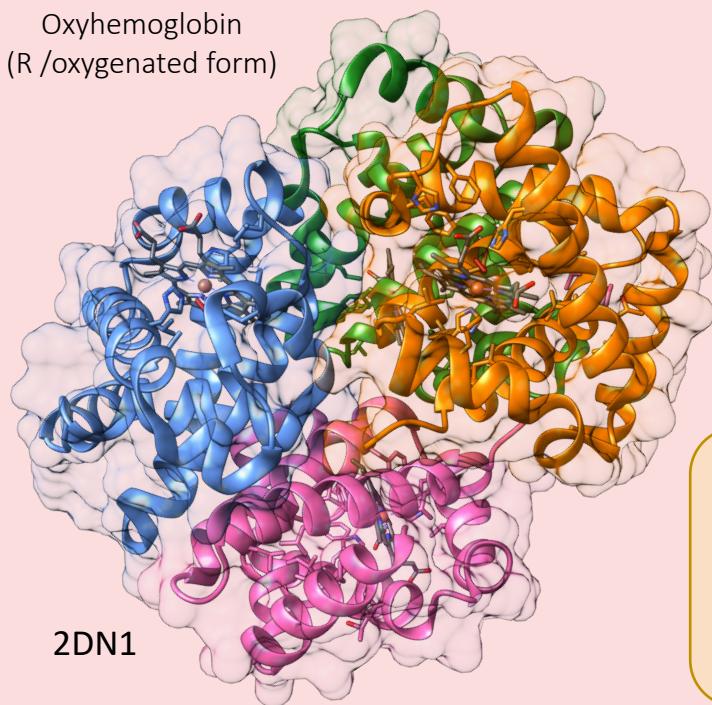


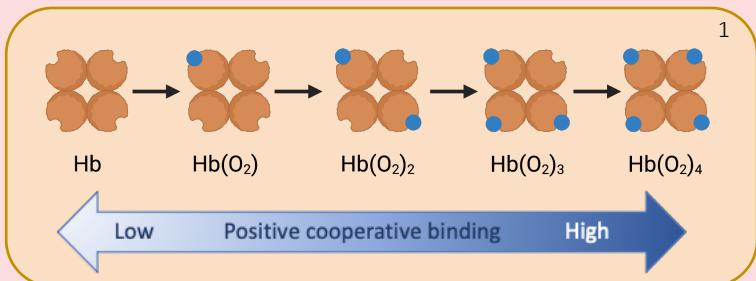
# OXYGEN TRANSPORTER



## Hemoglobin

Hb/Hgb

- protein that transports oxygen from the lungs to the body organs and tissues
- major component of red blood cells
- contains iron ( $\text{Fe}^{2+}$ ), causing red blood cell to appear red



### STRUCTURE

- **Heterotetramer**, made of two  $\alpha$  and two  $\beta$  subunits
- each  $\alpha$  and  $\beta$  subunit consists of 8 helices
- each subunit contains a **heme group** with an iron ( $\text{Fe}^{2+}$ ) that binds oxygen ( $\text{O}_2$ )
- two forms – oxy (R state) and deoxy (T state)
- $\text{O}_2$  binds **cooperatively** (binding of  $\text{O}_2$  causes a conformation change in Hb that facilitates additional  $\text{O}_2$  binding)

### LOCATION

- in vertebrates (fish, birds, amphibians, mammals)
- made by **red blood cells**
- red blood cells produced in bone marrow under the control of **erythropoietin** hormone secreted by kidneys
- Hb makes about 96% of the dry weight of mature red blood cells
- can be found in a variety of other tissues working as an antioxidant

### FUNCTION

- main function of **oxygen transport** - binds oxygen molecules in lungs and delivers them to tissues to allow for cellular respiration
- acts as a **buffer** – maintains pH of blood
- can bind other molecules, such as carbon monoxide, or cyanide with high affinity instead of oxygen, making these molecules toxic to humans

### Anemia, Thalassemia, and Ischemia

- **Anemia** – low Hb production or Hb mutations causing inability to carry oxygen
  - can be caused by iron deficiency, blood loss, or damage to bone marrow tissue
- **Thalassemia** - inherited genetic disorder characterized by abnormal Hb (homodimers) with lower affinity for oxygen
- **Ischemia** – condition of reduced blood flow (and thus oxygen) to organs, that in severe cases can cause tissue death, especially in the brain and heart

<sup>1</sup> Figure made in BioRender.com; Model made in UCSF Chimera