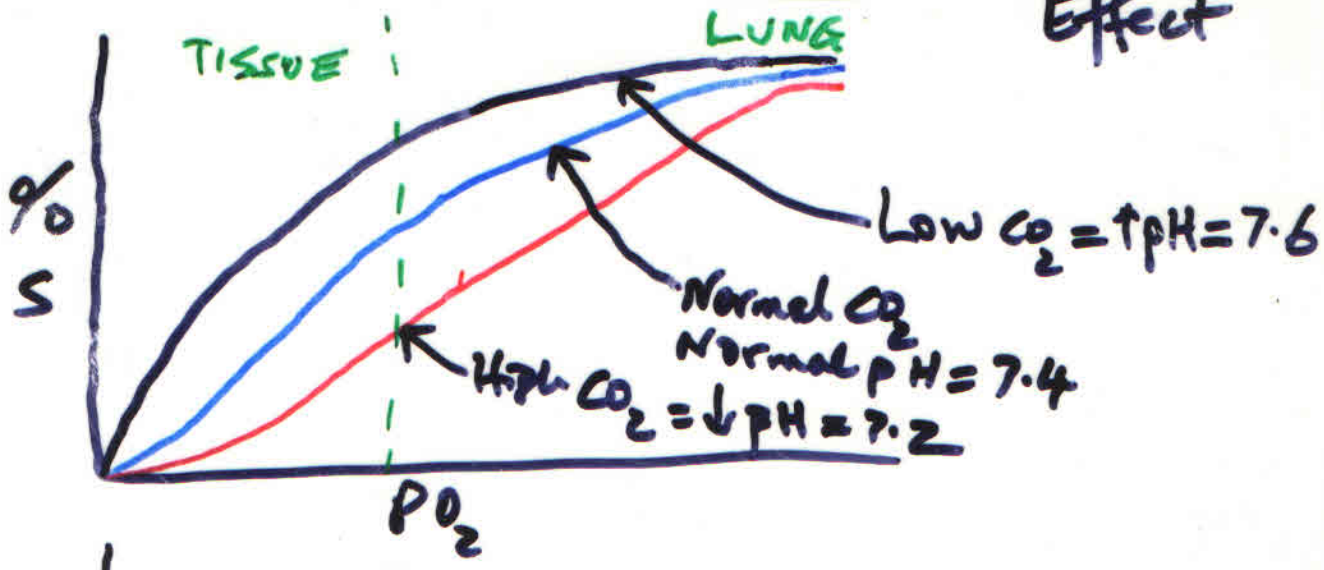
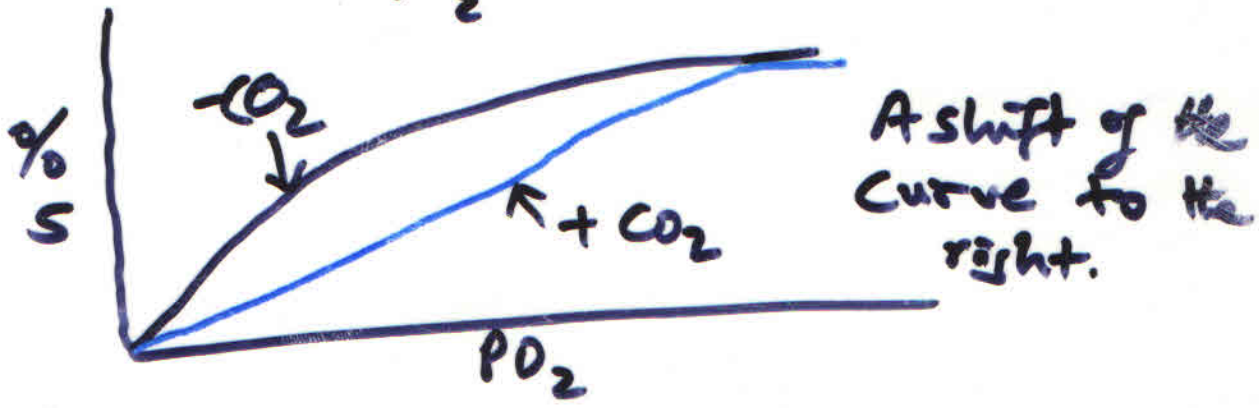
O_2 – Hb Dissociation curve = Bohr Effect





↑ Acidity = ↓ Hb affinity for O_2 decreases
= Bohr effect

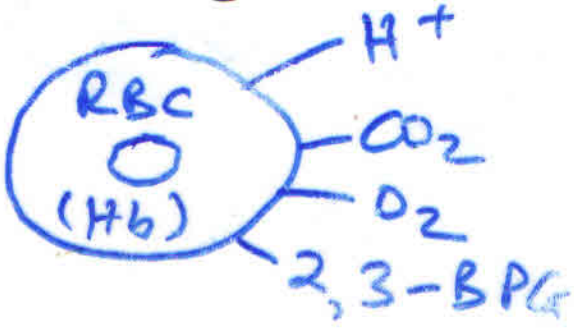
∴ O_2 dumped/left behind in needy tissues

CO_2 transport

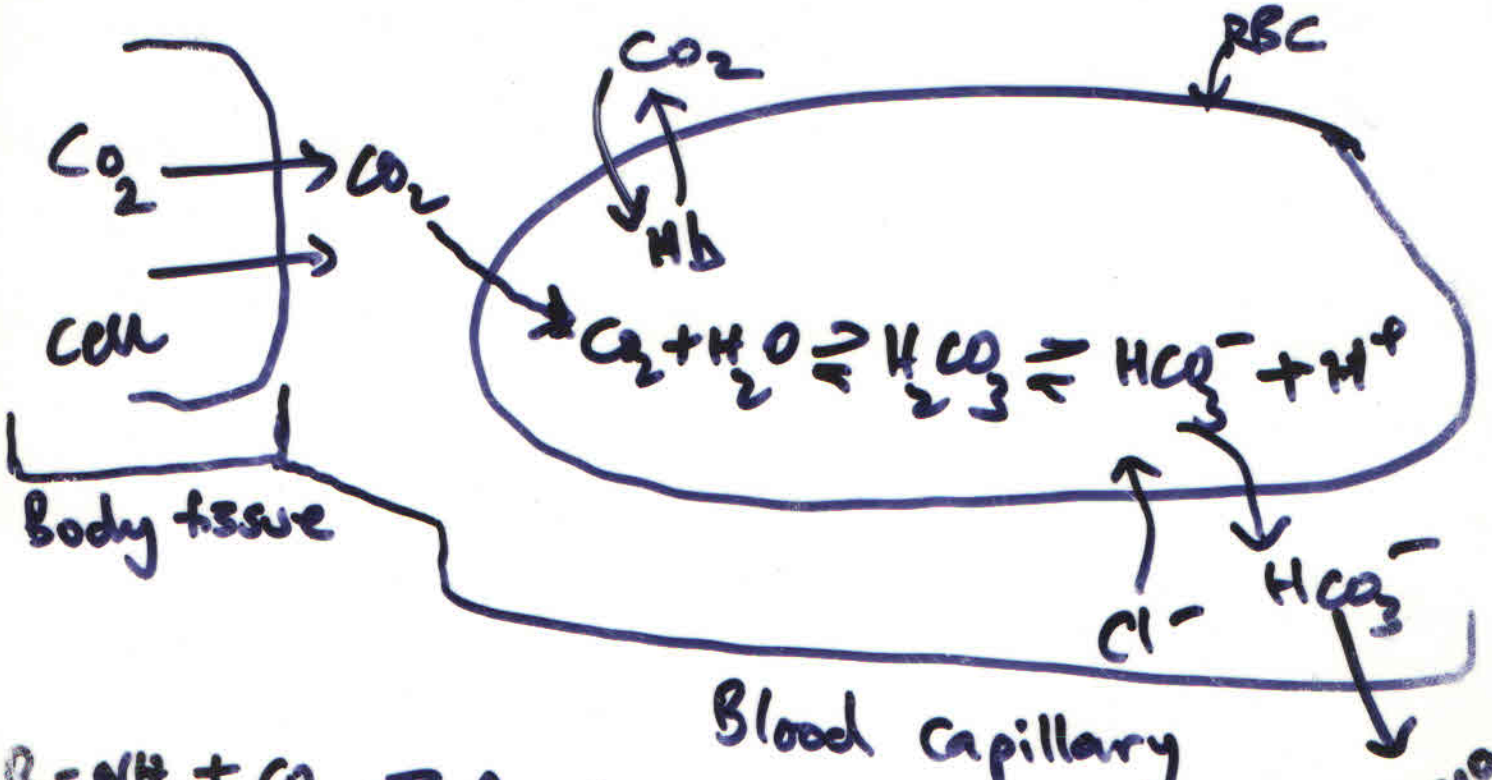
8% as CO_2 in plasma

20% as carbaminohemoglobin

72% as HCO_3^-



BOHR EFFECT Vs HALDANE EFFECT



$R-NH_2 + CO_2 \rightleftharpoons R-NH-COO^- + H^+$
(α-Subunit)

Carbamate.
||
Carbamino hemoglobin

TISSUES

$\uparrow CO_2$ $[H^+]\uparrow$
$\downarrow O_2$
$\downarrow pH$
$\uparrow$ 2,3-BPG
$\uparrow$ Temp.

BOHR EFFECT

- Hb holds less O_2
- Release more O_2
- CO_2/H^+ has effect of Hb on O_2.

LUNGS

$\downarrow CO_2$ $[H^+]\downarrow$
$\uparrow O_2$
$\uparrow pH$
$\downarrow$ 2,3-BPG
$\downarrow$ Temp.

HALDANE EFFECT

- Hb holds more O_2
- Does not release O_2
- O_2 has effect of Hb on CO_2/H^+

Role of Hb in transport of O_2 and CO_2

- Transport of O_2 { 2% in plasma
  98% bound to Hb

- Transport of CO_2 { 8% as CO_2 in plasma
  20% as carbamino-Hb
  72% as HCO_3^-

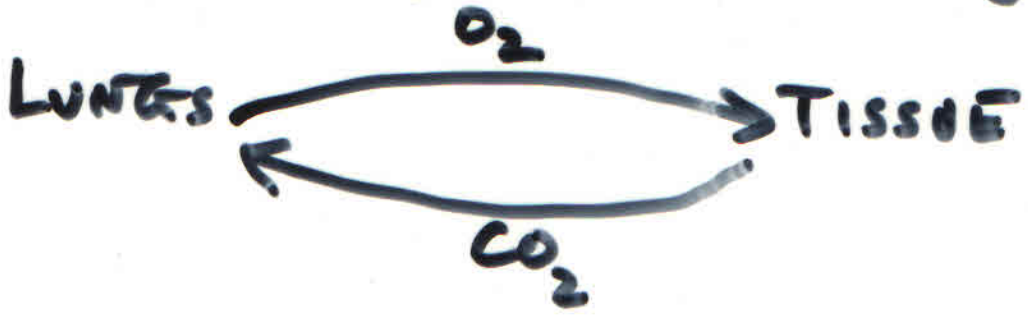
Factors that affect Hb capacity to carry O_2:
- CO_2
- Blood pH
- Body temp.
- Environmental factors e.g. Altitude
- Diseases e.g. Sickle cell anemia, Thalassemia

↑CO_2 ↑Temp. ↓pH = ↓O_2

NB
1. Deoxygenation of the blood decreases its ability to carry O_2 = CO_2 displaces O_2 from Hb = TISSUES
2. Oxygenation decreases blood's ability to carry CO_2 = O_2 displaces CO_2 from Hb = LUNGS

Q- Describe how O_2 is bound to Hb and transport to body tissues.

Q - Describe how CO_2 is bound to Hb and transported to the lungs.



or

Dissolved ↑ Exhaled ↑

$$CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons HCO_3^- + H^+ \rightleftharpoons H_2CO_3 \rightleftharpoons CO_2 + H_2O$$

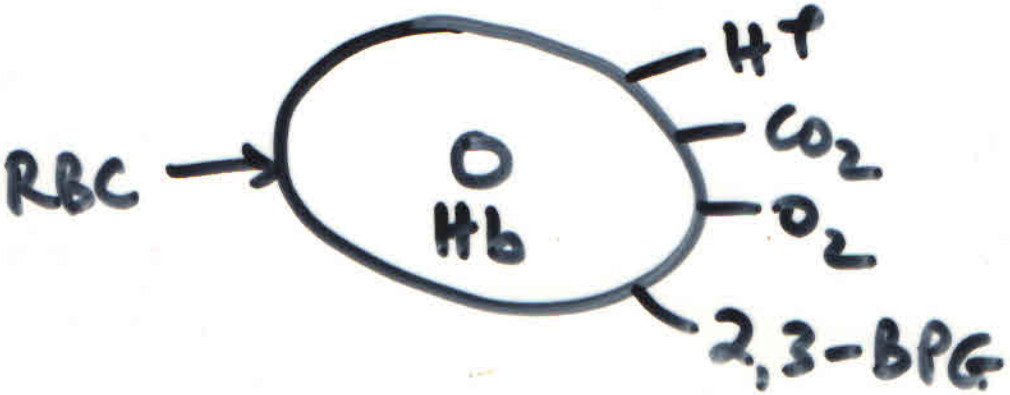
TISSUE | BLOOD | LUNGS

$$Hb + O_2 \rightleftharpoons HbO_2$$

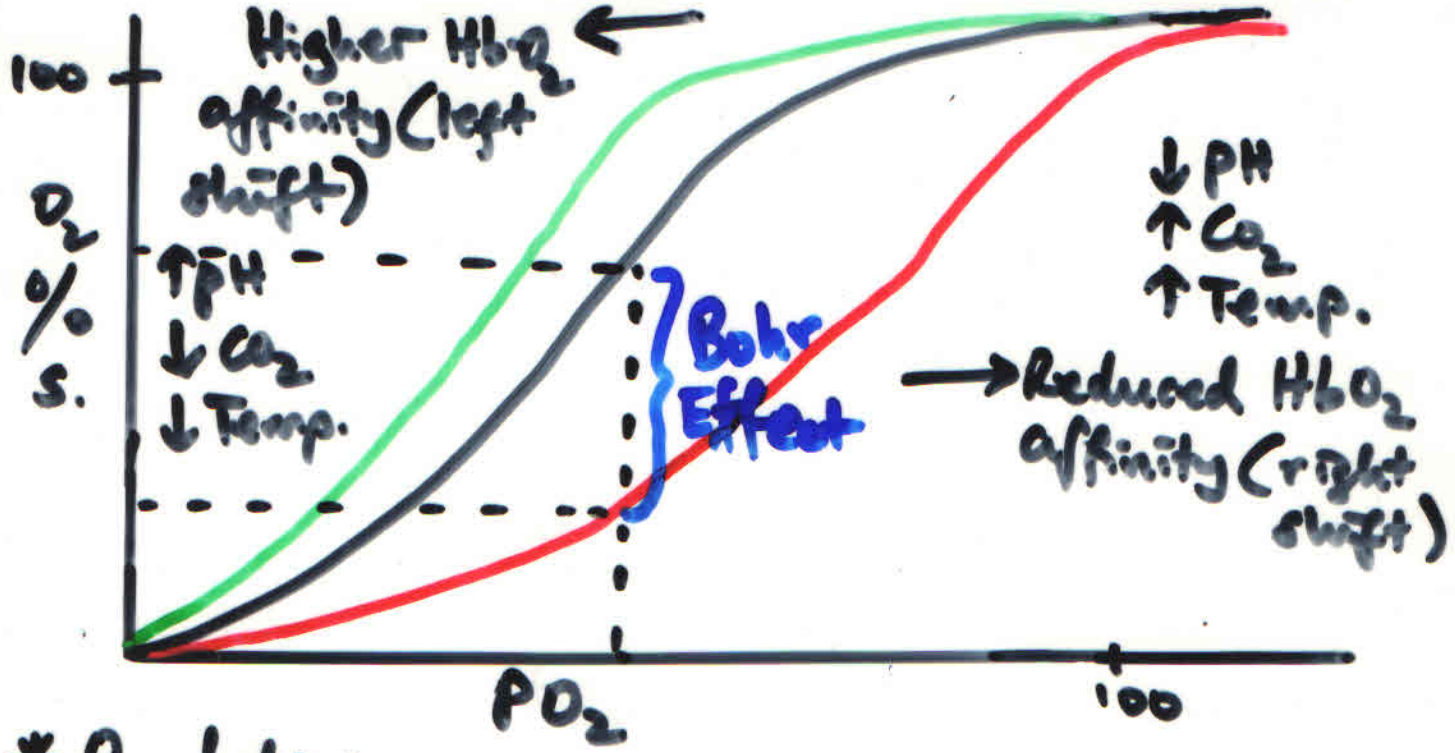
$$HbO_2 + CO_2 \rightleftharpoons Hb\text{-}COO^- + H^+ + O_2$$

$$HbO_2 + H^+ \rightleftharpoons H^+Hb + O_2$$

CO_2 and H^+ displace O_2 from Hb

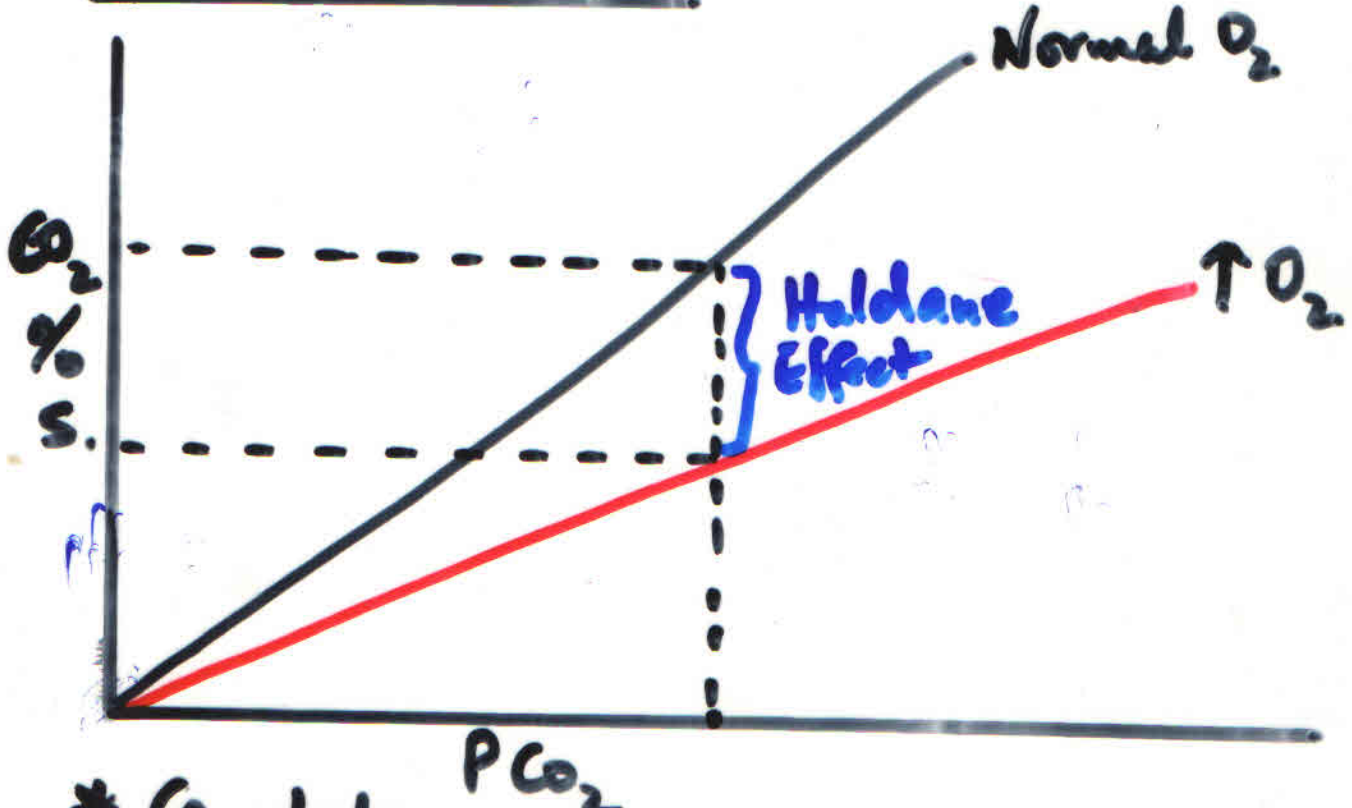


BOHR EFFECT



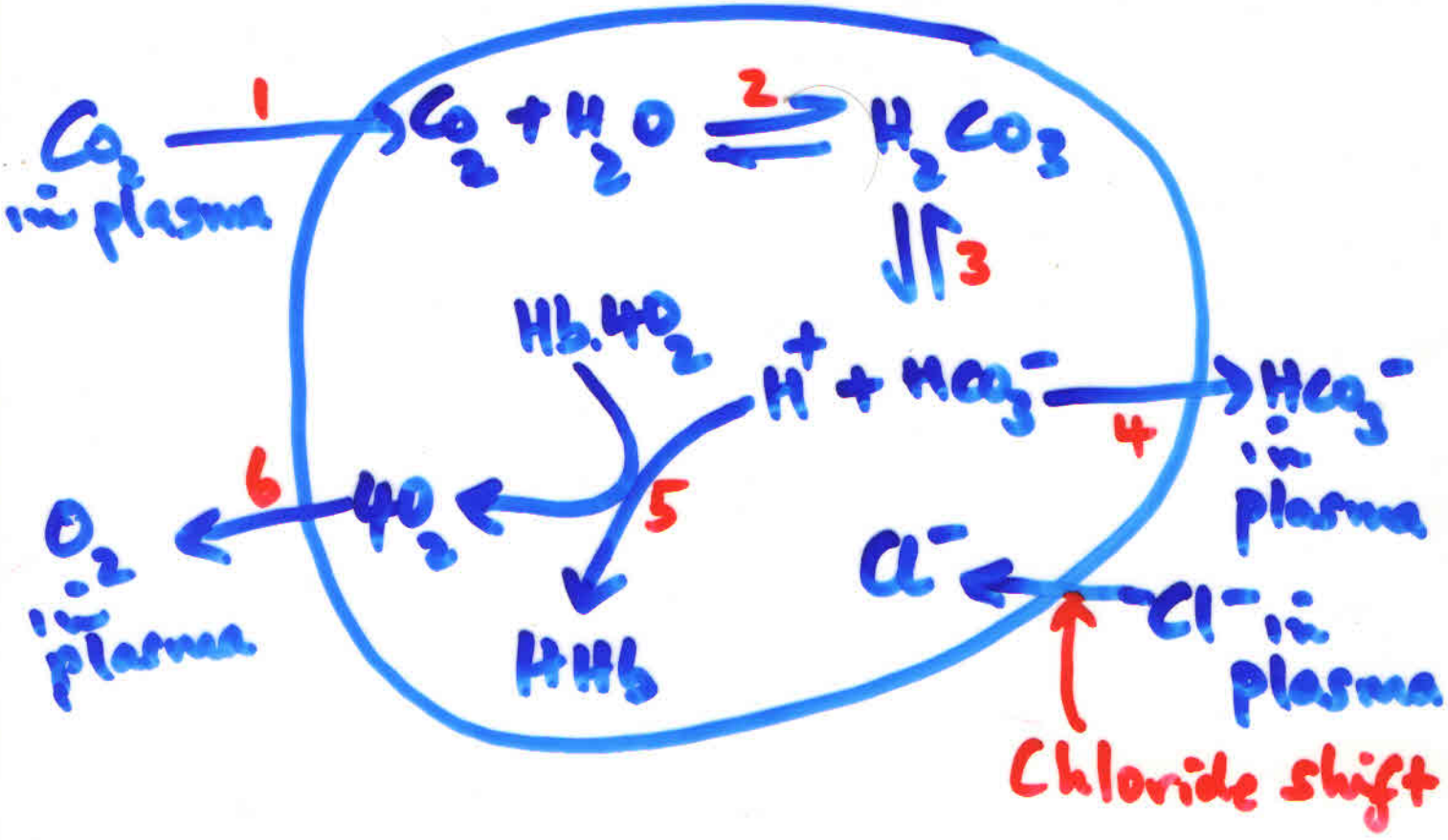
* O_2 delivery = relevant to tissue.

HALDANE EFFECT



* Co_2 delivery = Relevant to lungs.

* The presence of CO_2 helps the release of O_2 from Hb = Bohr Effect = TISSUE
* The presence of O_2 helps the release of CO_2 from Hb = Haldane Effect = LUNG



$$H_2O + CO_2 \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$$

$$Hb.4O_2 + H^+ \rightleftharpoons HHb + 4O_2$$

↑[CO_2] Respiring cell = Release of O_2 = Bohr

↑[O_2] Lungs = Release of CO_2 = Haldane