

TRANSPORT OF CARBON DIOXIDE

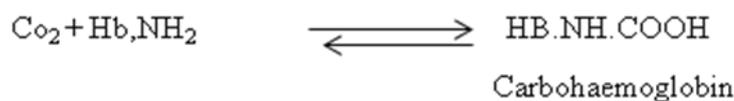
During respiration CO₂ is produced in the tissue as a result of different metabolic activities. Due to high PCO₂ in the tissue cells, they diffuse into the blood. This CO₂ must be transported to lungs, so that it can be eliminated through alveolar surface. The CO₂ transported to lung through two main ways-

- A. **In physical solution-** CO₂ enter to the blood, combine with the water of plasma and form carbonic acid (H₂CO₃). Approximately 5% of the total CO₂ produced in the tissue is transported to lung in this way.

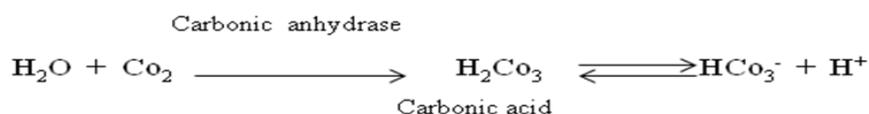


B. As chemical compound-

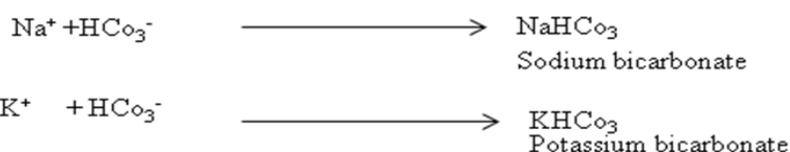
- i) **As carbamino compound-** about 15-20 % CO₂ is transported as carbamino compound. CO₂ directly combined with the amino group (-NH₂) of haemoglobin to form carbohaemoglobin



- ii) **As bicarbonate-** 80-85% CO₂ transported by this way. When CO₂ enter RBC it combine with water and form carbonic acid, as happened in the plasma, but the reaction is very much faster due to the presence of the enzyme carbonic anhydrase inside RBC. Carbonic acid then readily breaks down to HCO₃⁻ and H⁺.



HCO₃⁻ ion diffuse out to cytoplasm and in combination with Na⁺ and K⁺ ion forms sodium and potassium bicarbonate and transported to lung.



When the blood reach the lung, then due to low partial pressure of CO₂ and also for the high PO₂ they releases the CO₂ to the alveoli.

In order to balance the exit of HCO_3^- ions from the RBC, Cl^- enter RBC from plasma. This entry of Cl^- ion ensure the continuity of exit of HCO_3^- ion and so the formation of Bicarbonates. This shifting of Cl^- ion from plasma is therefore, an important phenomenon, called **Chloride shift or Hamburgers phenomenon**.

Release of CO_2 at the respiratory surface-

The carbonic acid, bicarbonates and carbohaemoglobin are carried to the lung with blood, where they breakdown under the influence of different factors and liberate free CO_2

- Carbonic anhydrase
- i) $\text{H}_2\text{CO}_3 \xrightarrow{\text{Carbonic anhydrase}} \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- Acidity of oxyhaemoglobin
- ii) $2\text{KHCO}_3 \xrightarrow{\text{Acidity of oxyhaemoglobin}} \text{K}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- Acidity of oxyhaemoglobin
- iii) $2\text{NaHCO}_3 \xrightarrow{\text{Acidity of oxyhaemoglobin}} \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- Reduction due to higher PO_2
- iv) $\text{Hb.NH.COOH} \xrightarrow{\text{Reduction due to higher } \text{PO}_2} \text{Hb. NH}_2 + \text{CO}_2 \uparrow$

The oxygenation of blood in the lungs enhances the release of additional amount of CO_2 from blood, a phenomenon called **Haldane effect**, opposite to Bohr's effect.