When the blood reaches the lungs all the above reactions are reversed. The reactions occurring in the lungs can be summarised as follows:

1. O_2 from alveoli diffuses into the plasma and RBC.
2. The O_2 combines with HHb to form HbO_2 and this releases H^+.
3. The H^+ combines with HCO^-_3 and forms H_2O and CO_2.
4. The CO_2 diffuses into the lung alveoli where it is expelled in the process of normal breathing.

Chloride Shift (Hamburger Phenomenon)

The diffusion of chloride ions into the RBC from the plasma and back is called ***chloride shift.***

From the tissue cells, CO_2 diffuses into the RBC via plasma. In the RBC, CO_2 combines with water to form carbonic acid (H_2CO_3). The H_2CO_3 immediately ionizes into H^+ and bicarbonate ions (HCO_3).

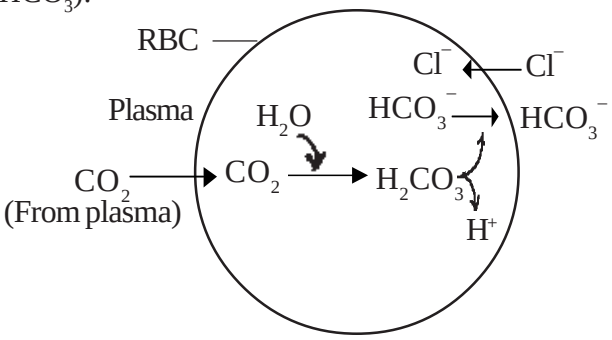

Fig.6.32: Chloride shift.

Bicarbonate ions are negatively charged and they diffuse into the plasma from RBC; but the positively charged H^+ remain inside the RBC. Thus the RBC becomes positively charged.

In order to maintain neutrality, negatively charged chloride ions (Cl^-) diffuse into the RBC from plasma. This phenomenon is called ***chloride shift***.

Chloride shift provides two advantages in CO_2 transport. They are

1. As bicarbonate ions move out of RBC, more and more bicarbonate ions are formed
2. The CO_2 capacity of RBC is increased by chloride shift.