HAEM-HAEM INTERACTION

When hemoglobin combines with the first oxygen molecule, its affinity for the second oxygen molecule increases. Similarly, binding with the second oxygen molecule increases its affinity for the third oxygen molecule and so on. This phenomenon is known as **Haem-Haem interaction** and it is responsible for the sigmoid shape of the oxygen-hemoglobin dissociation curve.

Note- When hemoglobin takes up a small amount of oxygen, the R state is favored and additional uptake of oxygen is facilitated. That is why the oxygen-hemoglobin dissociation curve, i.e., the curve relating percentage saturation of the oxygen carrying power of hemoglobin to the PO_2 has a characteristic sigmoid shape. Combination of the first heme in hemoglobin molecule with oxygen increases the affinity of the second heme for oxygen and the oxygenation of the 2^{nd} increases the affinity of the 3^{rd} etc., so that the affinity of the hemoglobin for the 4^{th} oxygen molecule is many times that for the first. When hemoglobin takes up oxygen, the two β chains move closer together and when oxygen is given up, they move farther apart. This shift is essential for the shift in affinity for oxygen to occur.

THE ROOT EFFECT

In some fishes, cephalopods (Octopus, Sepia etc.) and Crustaceans (Prawns, Crabs etc.), increase in CO_2 or a decrease in pHnot only cause a reduction in the oxygen affinity of hemoglobin, but also a reduction of the oxygen transport capacity. This is termed as the Root Effect.

REVERSE BOHR EFFECT

A decrease in pH results in an increase in oxygen affinity in hemocyanin of several Gastropods, Mollusks and and king crab *Limulus.* This is referred to as Reverse Bohr Effect.

Note- Reverse Bohr effect may serve to facilitate oxygen uptake during low oxygen availability. At that time the blood pH is also kept low.