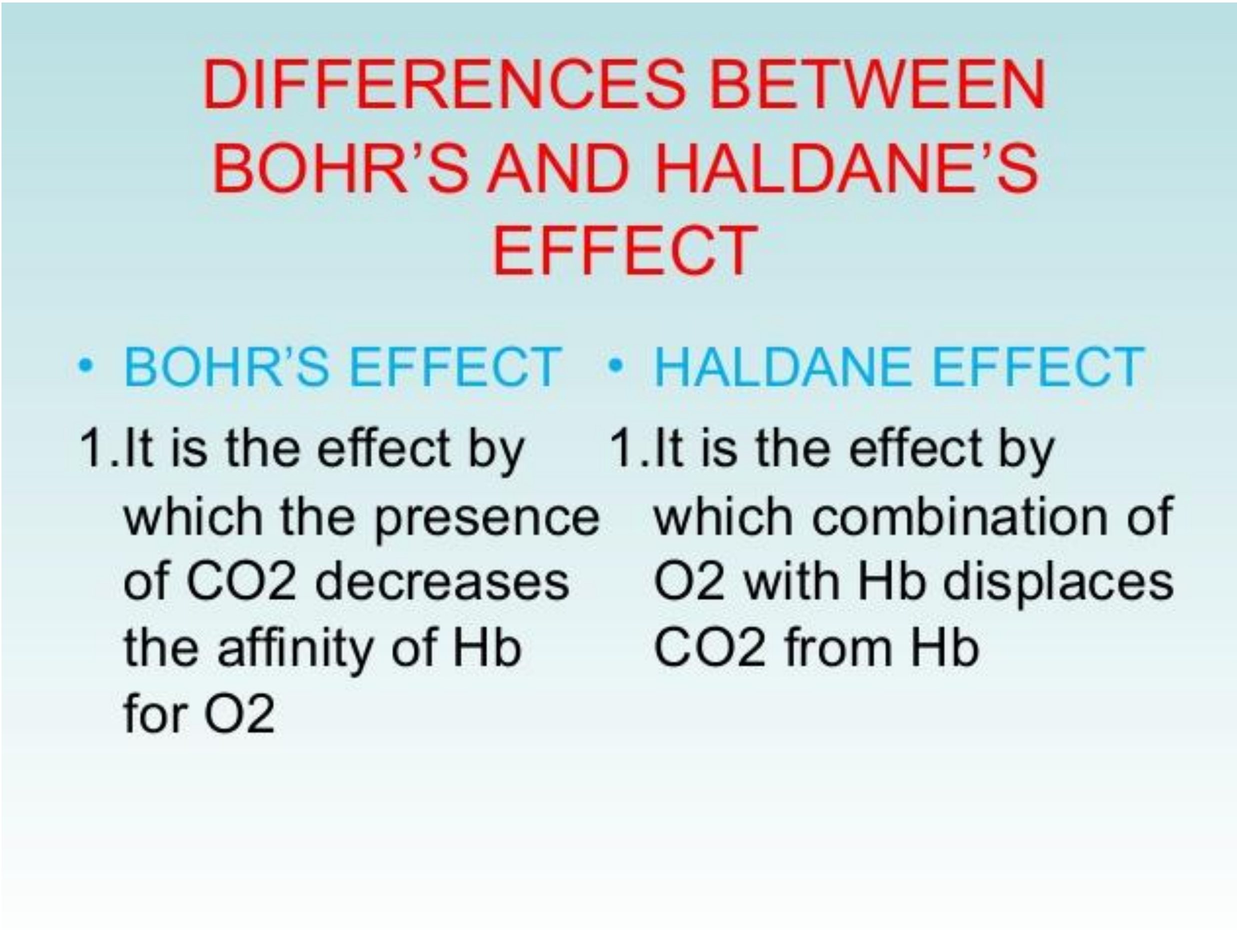


Haldane effects: Oxyhaemoglobin acts as strong acid,so oxyhaemoglobin is formed in the lungs, it releases more H+ ions which decreases ph value of the blood and increases acidity. The released H+ ions combine with HCO_3^- forming H_2CO_3 which soon dissociates into CO_2 and H_2O in presence of carbonic anhydrase.

HALDANE EFFECT:

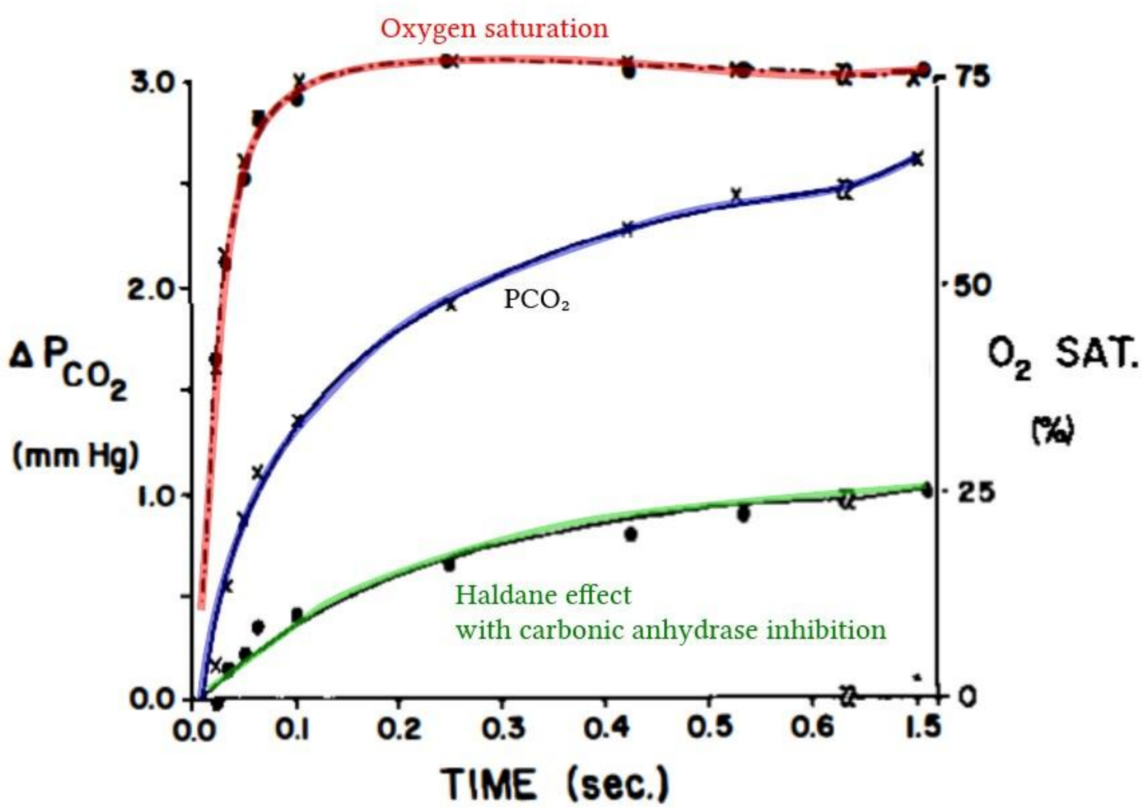
- The Haldane effect is a physicochemical phenomenon which describes the increased capacity of blood to carry CO_2 under conditions of decreased haemoglobin oxygen saturation

- Both Haldane and Bohr effects are the same features of the same phenomenon
- Haldane effect is what happens to pH and CO_2 binding because of oxygen, and Bohr effect is what happens to oxygen binding because of CO_2 and lower pH.
- More CO_2 binds to haemoglobin at lower oxygen saturation
- This effect facilitates the removal of CO_2 from the tissues
- Bound CO_2 is released from haemoglobin when it becomes oxygenated.
- This "reverse Haldane effect" facilitates the elimination of CO_2.
- There are two mechanisms:
- Deoxygenated haemoglobin has a higher affinity for CO_2
- This is due to the allosteric modulation of CO_2-binding sites by the oxygenated haem.
- The buffering capacity of deoxygenated haemoglobin is increased.

- Reduced (deoxygenated) haemoglobin becomes more basic.
- This increases the pH of the RBC cytosol
- With an increased pH, more carbonic acid may dissociate into bicarbonate
- Thus, the total amount of CO_2 carried as bicarbonate is increased
- Compared to the carriage of CO_2 by deoxyhaemoglobin, this part of the Haldane effect plays a minor role.

Haldane vs Bohr Effect

- The Haldane effect describes how **oxygen** concentrations determine hemoglobin's affinity for carbon dioxide.
  - **H** - emoglobins
  - **A** - ffinity
  - lDane - Carbon Dioxide
- The Bohr effect, on the other hand, describes how **carbon dioxide and H+** affect hemoglobin's affinity for oxygen.
  - B
  - **O** - xygen
  - **H** - ydrogen
  - **R** – eleased in tissue



BOHR EFFECT:

1. The Bohr effect describes the decrease in the oxygen affinity of haemoglobin in the presence of low pH or high CO2.
2. pH and CO2 both have effects on the haemoglobin tetramer.(EACH ALHA CHAIN=141X2 AND EACH BETA CHAIN =146X2=574 aminoacid).
3. At a low pH, the histidine residues on one haemoglobin dimer become protonated, which permits the fomration of a "salt bridge" between dimmers.
4. The formation of this bond stabilises the deoxygenated T-state.
5. The bond cannot form at a higher Ph.
6. At a high CO2, CO2 binds to terminal amino groups and forms negatively charged carbamate groups.
7. These carbamate groups also stabilise the deoxygenated T-state of the haemoglobin tetramer by forming bonds with the positively charged amino groups on the opposite dimer.
8. Thus, both pH and CO2 stabilise the deoxyhaemoglobin molecule and decrease its affinity for oxygen, which facilitates the release of oxygen in the peripheral tissues.

9. Quantitatively, the changes in pH play a greater role in changing the shape of the oxygen-haemoglobin disscoiation curve than do the changes in CO2.