Phosphate buffer

Although the **phosphate buffer** is not a very significant agent in maintaining of the pH of the extracellular fluid, it plays a major role in maintaining the acid-base balance **intracellularly** and in the **renal tubules**. The equilibrium pK constant of the system is 6.8, which is close to normal pH, which is 7.4, so this buffer is still operating at near maximum buffering power.

Mechanism of action

The main components of this [Buffer systems|buffer]] are:

- **$H_2PO_4^-$** – acidic buffer component → NaH_2PO_4
- **HPO_4^{-2}** – alcaline buffer component → Na_2HPO_4

When a strong acid (HCl, H_2SO_4) is added, HPO_4^{-2} accepts a hydrogen cation.

$$\mathbf{HCl + Na_2HPO_4 \rightarrow NaH_2PO_4 + NaCl}$$

The strong acid is thus replaced by the very weak acid NaH_2PO_4.

When a strong base (NaOH) is added, the OH^- group is buffered with $H_2PO_4^-$ to form water.

$$\mathbf{NaOH + NaH_2PO_4 \rightarrow Na_2HPO_4 + H_2O}$$

In this case, the strong base is therefore replaced by a weak base, namely Na_2HPO_4.

Locations of effect

In contrast to the extracellular environment, where this buffer plays a very small role, as it is only present in an 8% concentration compared to the bicarbonate buffer, it has an irreplacible role in tubules of kidneys. Je tomu tak ze dvou důvodů:

1. As the fluid passes through the tubule, the concentration of phosphate in the intratubular fluid increases.
2. Tubular fluid has a much lower pH than plasma and extracellular fluid and is therefore closer to the 6.8 value at which this buffer is most potent.

The phosphate buffer system is also very important in maintaining a constant pH in the intracellular fluid. The concentration of phosphate ions is significantly higher here.

Links

Related articles

- Acid-base balance
- Bicarbonate buffer
- Kidney function in maintaining acid-base balance
- Protein buffering system
- Buffer systems

Used literature

- HALL, J.E – GUYTON, A.C. *Textbook of Medical Physiology.* 12. edition. Philadelphia : Saunders Elsevier, 2011. 1091 pp. ISBN 978-1-4160-4574-8.