




Chloride shift

Biochemical functions

- ✓ Chloride is involved in the regulation of acid-base equilibrium, fluid balance and osmotic pressure.
- ✓ These functions are carried out by the interaction of chloride with Na^+ and K^+ . Chloride is necessary for the formation of HCl in the gastric juice.

- 
- ✓ Chloride shift involves the active participation of Cl.
 - ✓ The enzyme salivary amylase is activated by chloride.

Dietary requirements

- The daily requirement of chloride as NaCl is 5-10 g. Adequate intake of sodium will satisfy the chloride requirement of the body.

Sources

- Common salt as cooking medium, whole grains, leafy vegetables, eggs and milk

Absorption In normal


- circumstances, chloride is almost totally absorbed in the gastrointestinal tract.


Plasma chloride


- The normal plasma concentration of chloride is 92-110 mM/l. Cerebrospinal fluid (CSF) contains higher level of Cl⁻ (120 mM/l). This is due to the fact that protein content is low in CSF and, therefore, Cl⁻ is higher in order to maintain Donnan membrane equilibrium.


Excretion


- There exists a parallel relationship between excretion of chloride and sodium. The renal threshold for Cl^- is about 110 mEq/l.

- 
- The greater proportion (approx. 70%) of carbon dioxide is transported in the form of bicarbonates.
 - The CO_2 reacted with the water of the cytoplasm in the presence of enzyme carbonic anhydrase to form carbonic acid.

- 
- The carbonic acid is a weak acid, which undergoes partial dissociation to yield hydrogen ion (H^+) and bicarbonate ion.
 - The given reaction mostly occur inside RBCs, because the enzyme carbonic anhydrase is abundant there.

- 
- In RBCs, CO₂ combines with water to form carbonic acid which dissociates to give H⁺ ion and bicarbonate ion in the presence of carbonic anhydrase enzyme.
 - The bicarbonate ion then diffuses outside the RBC in the plasma and combines with Sodium ions to form Sodium bicarbonate (NaHCO₃).

- 
- Loss of bicarbonate ions from RBC causes positive charge inside RBC which is balanced by diffusion of chloride (Cl^-) ion from plasma into the RBC.
 - This exchange of Cl^- ion and HCO_3^- ion between plasma and RBCs is known as chloride shift.

- 
- This phenomenon of chloride shift maintain the electrical neutrality of cell.
 - This phenomenon is also known as **Hamburger** phenomenon.
 - Reverse of chloride shift occurs in various tissues.

Source: U Satyanarayana