

Role of Calcium in Biological System

Calcium is present in largest amount because of its being the main mineral constituent of bone and teeth. The metabolism of Ca mineral is regulated by Vitamin D and Parathormone.

Source: - Milk, Cheese, Egg yolk, Nuts, beans ... etc.

Physiological functions: -

- (1) Calcium along with Phosphorus been found to be essential for the formation and development of bones and teeth. It has same composition as the mineral apatite $(Ca_{10}(PO_4)_6X_2)$, where $X = F, Cl, OH$.
- (2) Ionised Calcium is needed in blood coagulation process.
- (3) It regulates the excitability of nerve fibres and nerve centres.
- (4) It is essential for nerve impulses and muscular contraction.
- (5) It tends to regulate the permeability of membrane.
- (6) It is essential for maintaining the integrity of intracellular material.
- (7) Calcium is the normal ratio with Potassium is known to maintain the normal activity of muscles.
- (8) It is needed for the activation of several enzymes like Succinate dehydrogenase, ATPase and certain proteolytic enzymes.

The main two mechanism are used for the absorption of Calcium by the intestinal mucosal cells.

- (A) An active transport process which is involving metabolic energy and Ca^{2+} ion Pump.
- (B) Simple diffusion.

Both the processes need 1,25 - dihydroxycholecalciferol.

It regulates the synthesis of the proteins involved.

In Ca^{2+} ion dependent ATPase.

Glucocorticoids inhibit Ca^{2+} absorption by some, as yet unknown mechanism.

Factors influencing Blood Calcium Level -

- (A) Parathyroid hormone. (B) Vitamin D (C) Plasma Proteins (D) Plasma Phosphate (E) Calcitonin.

Role of Magnesium ion in our Biological system

The 70% of body magnesium is found in association with Calcium and Phosphorus. The rest is found in all the cells of the other tissues and in blood and body fluids. Blood is having 2.4 mg/100ml. It is equally distributed between cells and plasma.

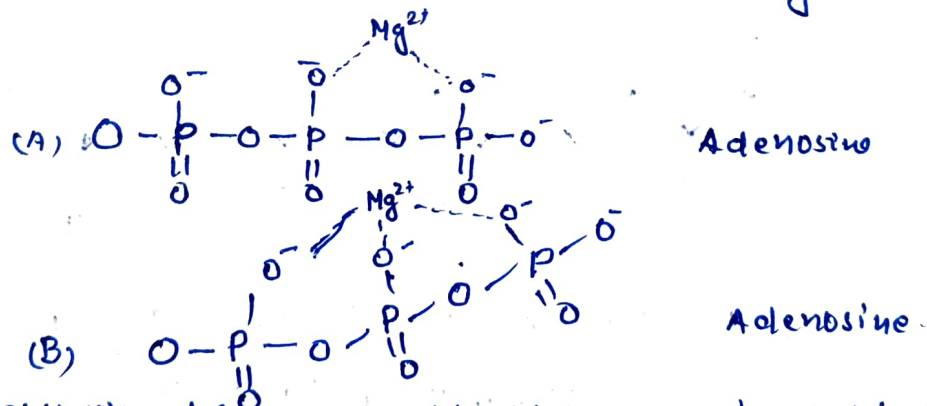
C.S.F (Cerebro spinal fluid) is also having about 3 mg/100 ml.
Source: Milk, eggs, fruits - etc.

The metal ion Mg^{2+} has high charge / radius ratio and consequently undergoes strong hydration as $[Mg(H_2O)_6]^{2+}$.

Therefore it plays important role in Biological system. One of its major roles is as a counterion to negatively charged $ROPO_3H_2^-$ in nucleotides and polynucleotides.

Magnesium helps to stabilize the three dimensional structure of ribonucleic acid (RNA) and deoxy ribonucleic acid (DNA) and thus crucial to proper functioning of genetic machinery of the cell.

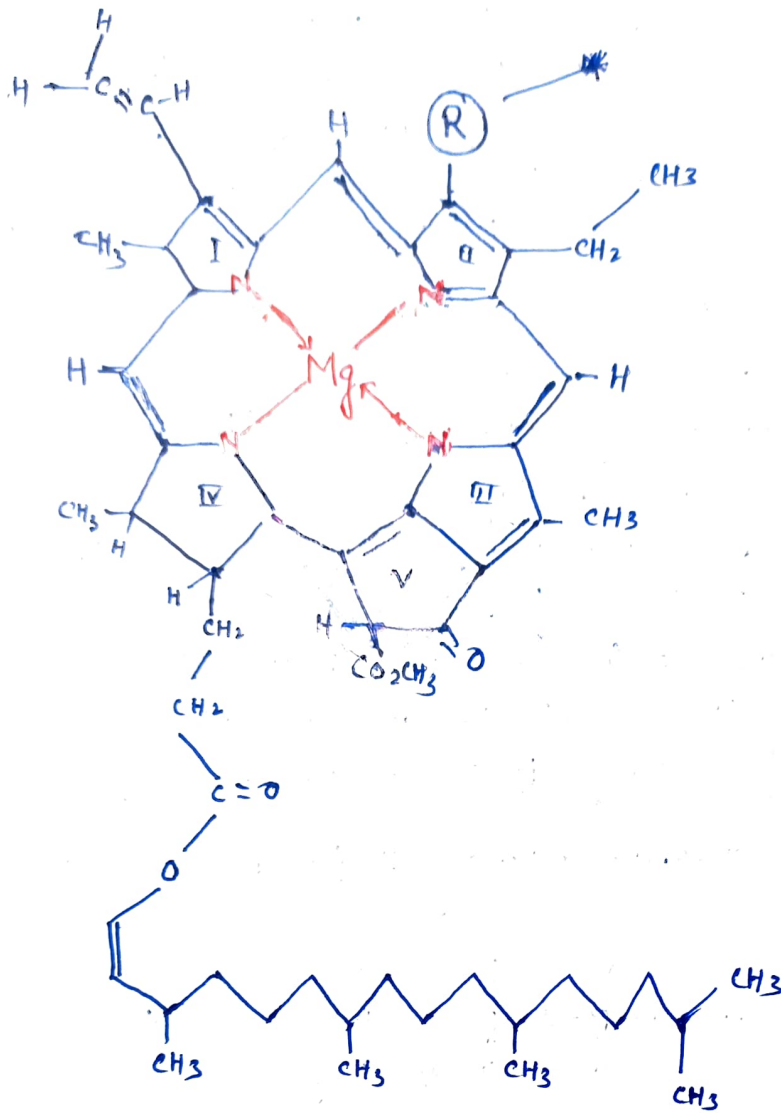
The proposed str. of complex formed between Mg^{2+} and ATP is as follows



The conversion of sugars to phospho-sugars is achieved in the presence of adenosine triphosphate (ATP), catalysed by kinase-enzyme.

All kinase enzymes require the presence of divalent metal ion, Mg^{2+} being the most common complex with triphosphate group, facilitating the cleavage of a Phosphorus - Oxygen bond.

Magnesium also has a unique role in green plants as a central atom of Chlorophyll.



24 the structure of Chlorophyll a & b

Chlorophyll a ($R = CH_3$)

& Chlorophyll b ($R = CHO$)

It required for phosphoresence to occur during the process of Photosynthesis.