

Metal ions in Biological Systems

Essential and trace elements Present in our biological system.

The Principal (Macro) Mineral elements: -

There are seven essential elements. Such as Calcium, Magnesium, Sodium, Potassium, Phosphorous, Sulphur and Chlorine.

1. Sodium, Potassium and chlorine are involved mainly in the maintenance of acid-base balance and osmotic control of water metabolism.
2. Calcium, Phosphorous and Magnesium act as constituents of bones and teeth.
3. Phosphorous forms a constituent of body cells of soft tissues, such as muscles, liver etc.
4. Sulphur forms a constituent in Cysteine and methionine, thiamine, biotin, Lipic acid and CoA.

Trace Elements

These elements are found in living tissues in small amounts.

They are subdivided into three groups i.e. Essential, possibly essential & non-essential.

1. Essential trace elements: (Micronutrients): Iron, Iodine, Copper, Zinc, Manganese, Cobalt, Molybdenum, Selenium, Chromium, and fluorine.
2. Possibly essential trace elements: - Nickel, Tin, Vanadium & Silicon.
3. Non essential trace elements: Aluminium, boron, Germanium, Cadmium, Arsenic, Lead and Mercury.

Physiological Importance: -

- (a) Iodine is needed for thyroxine formation.
- (b) Iron and Copper are needed for hemoglobin formation.
- (c) Zinc is a constituent of Carbonic anhydrase & insulin.
- (d) Cobalt is a constituent of Vitamin B₁₂.

The ratio of one element to the other in the tissues is of physiological importance.

Once again we can classify essential and Trace elements as follows.

i.e. There are thirty (Maximum) elements that have been accepted as essential and indispensable to our life.

The elements which are required in large quantity for our life are called Macro nutrients.

and the less amount required elements for our life is called Micro nutrients or those elements which are required in small quantities are refer as micronutrients.

Now the essential elements can be classified in two groups
i.e. (A) Bulk elements (B) Trace elements.

(A) Bulk elements :- Elements found in our living cage with higher concentration or those essential elements which are found in maximum amount in our body is called Bulk elements (Livings).

(B) Elements present in low concentration (i.e. minimum) are called trace elements.

The above facts may be tabled as follows.

(i) Bulk (Max^m found) elements with its Symbols.

(a) Hydrogen (H), (b) Carbon (C), (c) Nitrogen (N), (d) Oxygen (O)
(e) Phosphorus (P), (f) Sulphur (S)

(ii) Mineral elements :-
(a) Sodium (Na), (b) Potassium (K), (c) Magnesium (Mg)
(d) Calcium (Ca), (e) Chlorine (Cl)

(iii) Trace elements :- Trace mineral elements are as
(a) Iron (Fe), (b) Copper (Cu), (c) Zinc (Zn), (d) Vanadium (V)
(e) Nickel (Ni), (f) Cadmium (Cd), (g) Lithium (Li), (h) Lead (Pb), (i) Tin (Sn)

(iv) Ultra trace elements (Metal) :-
(a) Manganese (Mn), (b) Molybdenum (Mo), (c) Chromium (Cr), (d) Arsenic (As)

(v) Ultra trace (Non-Metal) Elements :-
(a) Fluorine (F), (b) Iodine (I), (c) Boron (B), (d) Silicon (Si), (e) Selenium (Se)

Role of Metallic elements in our biological system :-

The following are the important role i.e. a variety of important roles of metallic elements in our biological system.