

Electrolytes

are minerals in your body that have an electric charge. They are in your blood, urine, tissues, and other body fluids. Electrolytes are important because they help

- Balance the amount of water in your body
- Balance your body's acid/base (pH) level
- Move nutrients into your cells
- Move wastes out of your cells
- Make sure that your nerves, muscles, the heart, and the brain work the way they should

In the Table (1) illustrated the electrolyte in the body

Table (1):The electrolyte in the body

<i>Solutes</i>	<i>Plasma mEq / L</i>	<i>Interstitial fluid (mEq/L)</i>	<i>Intracellular fluid (mEq/L)</i>
Cations:			
Sodium	140	146	12
Potassium	4	5	160
Calcium	5	3	–
Magnesium	1.5	1	34
Anions:			
Chloride	105	117	2
Bicarbonate	24	27	10
Sulfate	1	1	–
Phosphate	2	2	140
Protein	15	7	54
Other anions	13	1	–

Note - $\text{mEq/L} = \text{mmol/L} \times \text{valency}$

POTASSIUM (K⁺)

Total body potassium is about 3500 mEq, out of which 75% is in skeletal muscle. Potassium is the major intracellular cation, and maintains intracellular osmotic pressure. The depolarization and contraction of heart require potassium. During transmission of nerve impulses, there is sodium influx and potassium efflux; with depolarization. After the nerve transmission, these changes are reversed. The intracellular concentration gradient is maintained by the Na⁺ K⁺ ATPase pump.

Requirement

Potassium requirement is 3–4 g per day

Sources

Sources rich in potassium, but low in sodium are banana, orange, apple, pineapple, almond, dates, beans, yam and potato. Tender coconut water is a very good source of potassium.

Normal Level

Plasma potassium level is 3.5–5.2 mmol/L. The cells contain 160 mEq/L; so precautions should be taken to prevent hemolysis when taking blood for potassium estimation. The K⁺ in serum is estimated directly by using an ion selective electrode. Excretion of potassium is mainly through urine. Aldosterone and corticosteroids increase the excretion of K⁺. On the other hand, K⁺ depletion will inhibit aldosterone secretion

Hypokalemia

This term denotes that plasma potassium level is below 3 mmol/L. A value less than 3.5 mmol/L is to be viewed with caution. Mortality and morbidity are high. The causes of hypokalemia illustrated in Table (2).

Table (2): causes of hypokalemia

<ol style="list-style-type: none">1. Increased renal excretion<ul style="list-style-type: none">- Cushing's syndrome- Hyperaldosteronism- Renal tubular acidosis- Adrenogenital syndrome2. Shift or redistribution of potassium<ul style="list-style-type: none">- Alkalosis- Insulin therapy3. Gastrointestinal loss<ul style="list-style-type: none">- Diarrhea, vomiting, aspiration- Deficient intake or low potassium diet4. Intravenous saline infusion in excess5. Drugs<ul style="list-style-type: none">- Insulin- Osmotic diuretics- Corticosteroids
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Hyperkalemia

Plasma potassium level above 5.5 mmol/L is known as hyperkalemia. Since the normal level of K^+ is kept at a very narrow margin, even minor increase is life threatening. The causes of hyperkalemia are illustrated in table (3).

Table (3): The causes of hyperkalemia

- 1. Decreased renal excretion of potassium**
 - Renal failure
 - Severe volume depletion (heart failure)
- 2. Entry of potassium to extracellular space**
 - Increased hemolysis
 - Tumor lysis after chemotherapy
 - Excess potassium supplementation
- 3. Redistribution of potassium to extracellular space**
 - Metabolic acidosis
 - Tissue hypoxia
- 4. Transmembrane shift**
- 5. Pseudohyperkalemia**
 - Factitious (K^+ leaches out when blood is kept for a long time before separation)
 - Improper blood collection (hemolysis)
- 6. Hyperkalemic periodic paralysis**
- 7. Drugs**
 - Spironolactone
 - ACE inhibitors
 - Beta blockers

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