

**Republic of Iraq Ministry of Higher
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Fluids and Electrolytes

Lec(3)

First stage

By

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introduction

The body contains a large variety of ions, or electrolytes, which perform a variety of functions. Some ions assist in the transmission of electrical impulses along cell membranes in neurons and muscles. Other ions help to stabilize protein structures in enzymes. Still others aid in releasing hormones from endocrine glands. All of the ions in plasma contribute to the osmotic balance that controls the movement of water between cells and their environment.

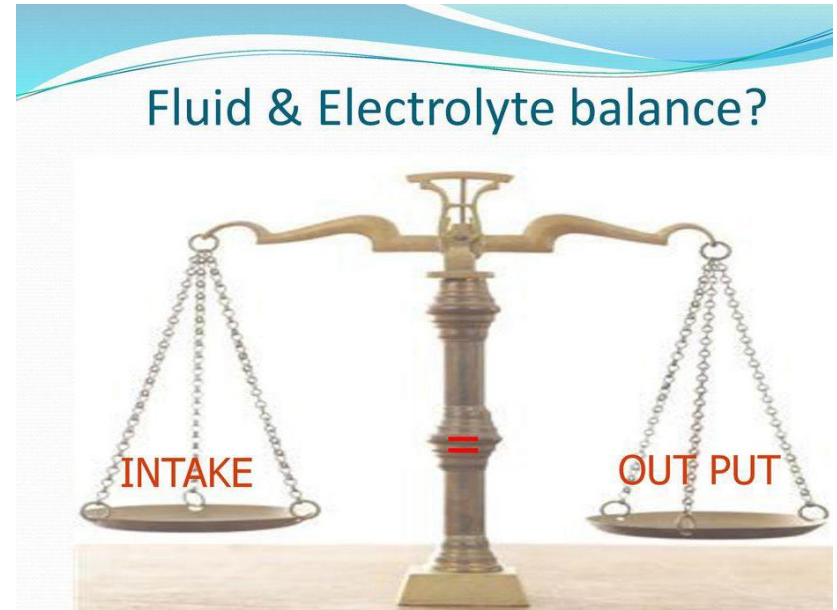
Electrolytes in living systems include sodium, potassium, chloride, bicarbonate, calcium, phosphate, magnesium, copper, zinc, iron, manganese, molybdenum, copper, and chromium. In terms of body functioning, six electrolytes are most important: sodium, potassium, chloride, bicarbonate, calcium, and phosphate.

Fluids Balance

The amount of water gained each day equals the amount lost.

Electrolyte balance The ion gain each day equals the ion loss.

Acid base balance H gain is offset by their loss.



Types of Body Fluids

There are two types of body fluids:

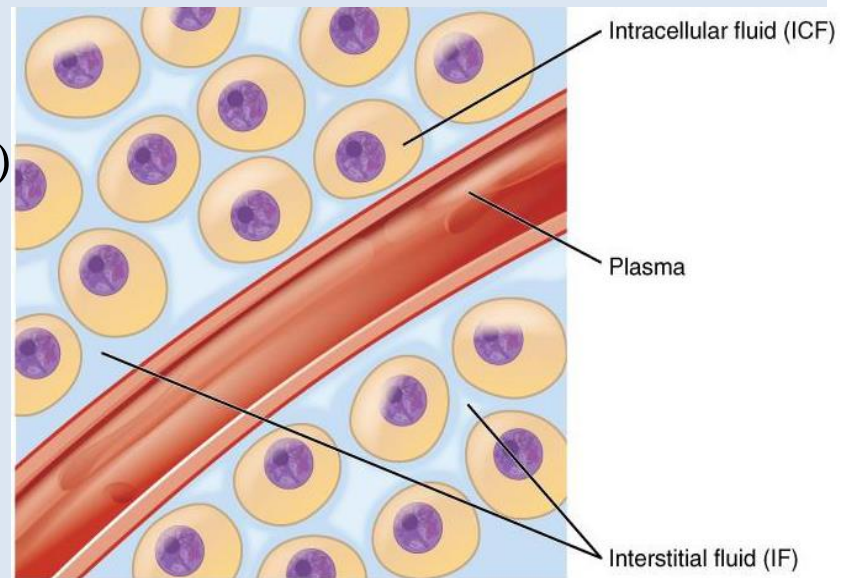
1-Intracellular fluid (ICF) which finds inside the cells, 55% of total body weight.

2-Extracellular fluid (ECF) which finds outside the cells, 45% of total body weight. 80% of extracellular fluid is present between the cells.

plasma present in blood approximately 20% of extracellular.

Factors that affect body fluids are:

- 1.Age.(80% Baby, 60% Adult, 40% aged)
- 2.Gender.
- 3.Body fat content.



(ICF) Intracellular fluid (ICF)

(IF) Interstitial fluid (ECF)

Composition of Body Fluids

1-Water.

2-Non electrolytes.

- Do not dissociate.
- Mostly organic molecules.
- Do not contribute in osmotic activity.

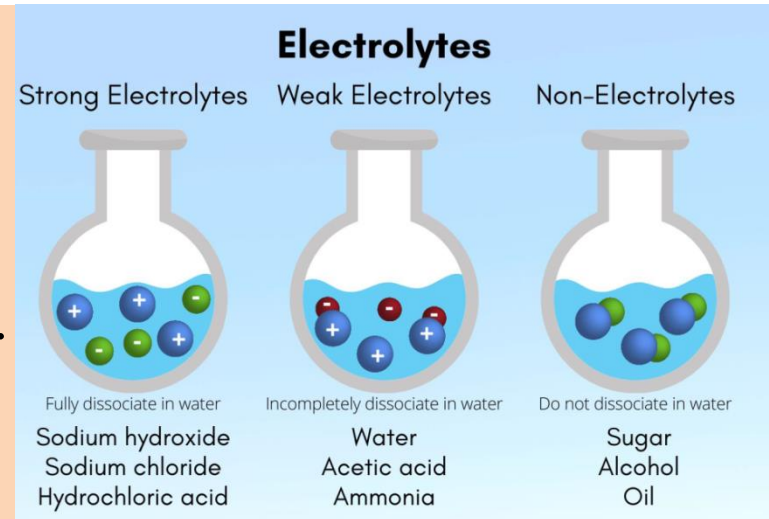
3-Electrolytes.

- Dissociate (ionic bonds).
- Charged particles. (electricity).
- Responsible for osmotic activity.

Water moves between ICF ECF which end to change in solute concentration.

The exchange is regulated by hydrostatic osmotic.

Pressure Changes of solute concentration in any compartment affect water flow.



Electrolytes

Electrolytes are an element or compound that, when melted or dissolved in water or another solvent, dissociates into ions and is able to conduct an electric current.

Electrolytes are minerals in your body that have an electric charge. They are in blood, urine and body fluids. Maintaining the right balance of electrolytes helps the body's blood chemistry, muscle action and other processes.

Levels of electrolytes in our bodies can become too low or too high. That can happen when the amount of water in your body changes, causing dehydration or overhydration. Causes include some medicines, vomiting, diarrhea, sweating or kidney problems.

ROLES OF ELECTROLYTES

These six ions aid in nerve excitability, endocrine secretion, membrane permeability, buffering body fluids, and controlling the movement of fluids between compartments. These ions enter the body through the digestive tract. More than 90 percent of the calcium and phosphate that enters the body is incorporated into bones and teeth, with bone serving as a mineral reserve for these ions.

In the event that calcium and phosphate are needed for other functions, bone tissue can be broken down to supply the blood and other tissues with these minerals.

Excretion of ions occurs mainly through the kidneys, with lesser amounts lost in sweat and in feces. Excessive sweating may cause a significant loss, especially of sodium and chloride. Severe vomiting or diarrhea will cause a loss of chloride and bicarbonate ions.

SYMPTOMS AND CAUSES OF ELECTROLYTE IMBALANCE

Common symptoms of an electrolyte disorder include

- Irregular heartbeat
- Fast heart rate
- Fatigue
- Lethargy
- Convulsions or seizures
- Nausea
- Vomiting
- Diarrhea and constipation
- Abdominal cramping
- Muscle cramping
- Headache

CAUSES OF ELECTROLYTE IMBALANCE

1. It may cause because of excessive loss of body fluids through prolonged vomiting, diarrhea or sweating.
2. This may also develop due to fluid loss related to burns.
3. Certain medication can also cause electrolyte imbalance.

osmosis is net movement of water from an area of low solute concentration to an area of higher solute concentration across a semi-permeable membrane.

Diffusion: is the net movement of solute from an area of high solute concentration to an area of lower solute concentration.

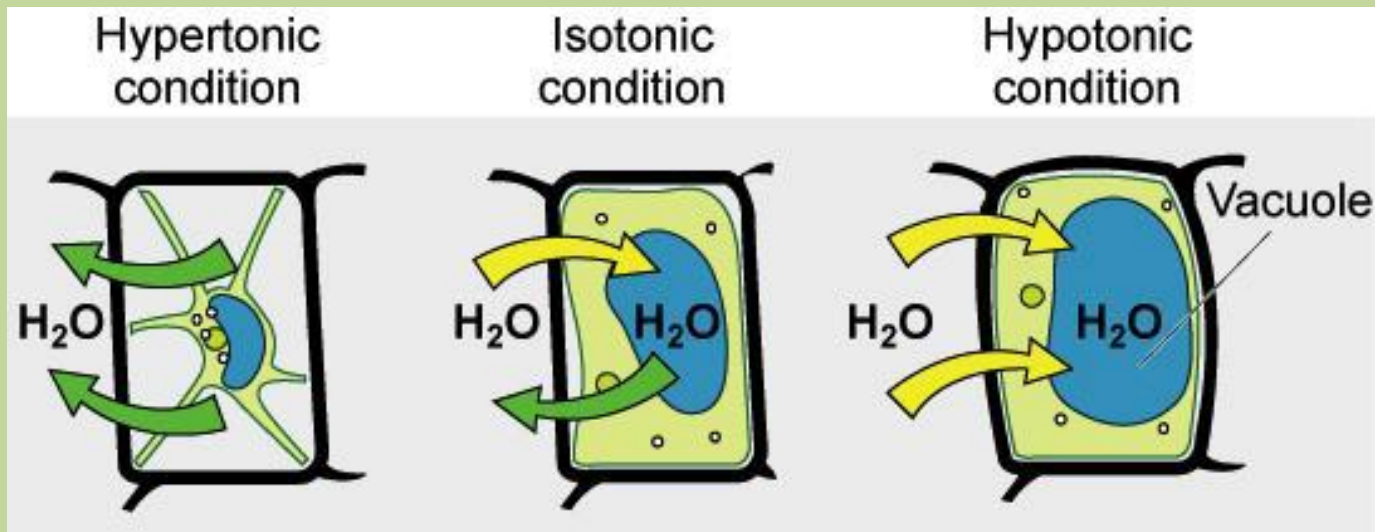
Excretion is any process which gets rid of unwanted metabolic products. This includes carbon dioxide, in the air we breathe out nitrogen and salts in sweat.

The main organs concerned with excretion in the body are the kidneys.

Isotonic: the solutions being compared have equal concentrations of solutes.

Hypertonic: the solution with the higher concentration of solutes.

Hypotonic: the solution with the lower concentration of solutes.



Sodium

Sodium is the major cation of the extracellular fluid. It is responsible for one-half of the osmotic pressure gradient that exists between the interior of cells and their surrounding environment. humans require only 1 to 2 mmol/day. excess sodium appears to be a major factor in hypertension (high blood pressure) in some people.

Hyponatremia is a lower-than-normal concentration of sodium, usually associated with excess water accumulation in the body, which dilutes the sodium. An absolute loss of sodium may be due to a decreased intake of the ion coupled with its continual excretion in the urine.

Hypernatremia is an abnormal increase of blood sodium. It can result from water loss from the blood, resulting in the hemoconcentration of all blood constituents. Hormonal imbalances involving ADH (antidiuretic hormone) and aldosterone may also result in higher-than-normal sodium values.

Potassium

Potassium is the major intracellular cation. It helps establish the resting membrane potential in neurons and muscle fibers after membrane depolarization and action potentials. In contrast to sodium, potassium has very little effect on osmotic pressure.

Hypokalemia is an abnormally low potassium blood level. Similar to the situation with hyponatremia, hypokalemia can occur because of either an absolute reduction of potassium in the body or a relative reduction of potassium in the blood due to the redistribution of potassium.

Hyperkalemia, an elevated potassium blood level, also can impair the function of skeletal muscles, the nervous system, and the heart. Hyperkalemia can result from increased dietary intake of potassium.

Chloride

Chloride is the predominant extracellular anion. Chloride is a major contributor to the osmotic pressure gradient between the ICF and ECF.

Hypochloremia, or lower-than-normal blood chloride levels, can occur because of defective renal tubular absorption. Vomiting, diarrhea, and metabolic acidosis can also lead to hypochloremia.

Hyperchloremia, or higher-than-normal blood chloride levels, can occur due to dehydration, excessive intake of dietary salt (NaCl) or swallowing of sea water. In people who have cystic fibrosis, chloride levels in sweat are two to five times those of normal levels, and analysis of sweat is often used in the diagnosis of the disease.

Calcium

About two pounds of calcium in your body are bound up in bone, which provides hardness to the bone and serves as a mineral reserve for calcium and its salts for the rest of the tissues. Teeth also have a high concentration of calcium within them.

Hypocalcemia, or abnormally low calcium blood levels, is seen in hypoparathyroidism, which may follow the removal of the thyroid gland, because the four nodules of the parathyroid gland are embedded in it.

Hypercalcemia, or abnormally high calcium blood levels, is seen in primary hyperparathyroidism. Some malignancies may also result in hypercalcemia.

Composition of Saliva

Saliva is a complex secretion about 93% by volume is secreted by the major salivary glands and the remaining 7% by the minor glands, about 99 % of saliva is water and the other 1% is composed of organic and inorganic molecules .

Saliva contains a supersaturated solution of calcium and phosphate, which neutralizes acids .The most effective ions present in human saliva that play a role in this protection are calcium, phosphate and fluoride. In addition to the ions, saliva also protects from acidic challenges by forming a salivary pellicle on the tooth surface .

