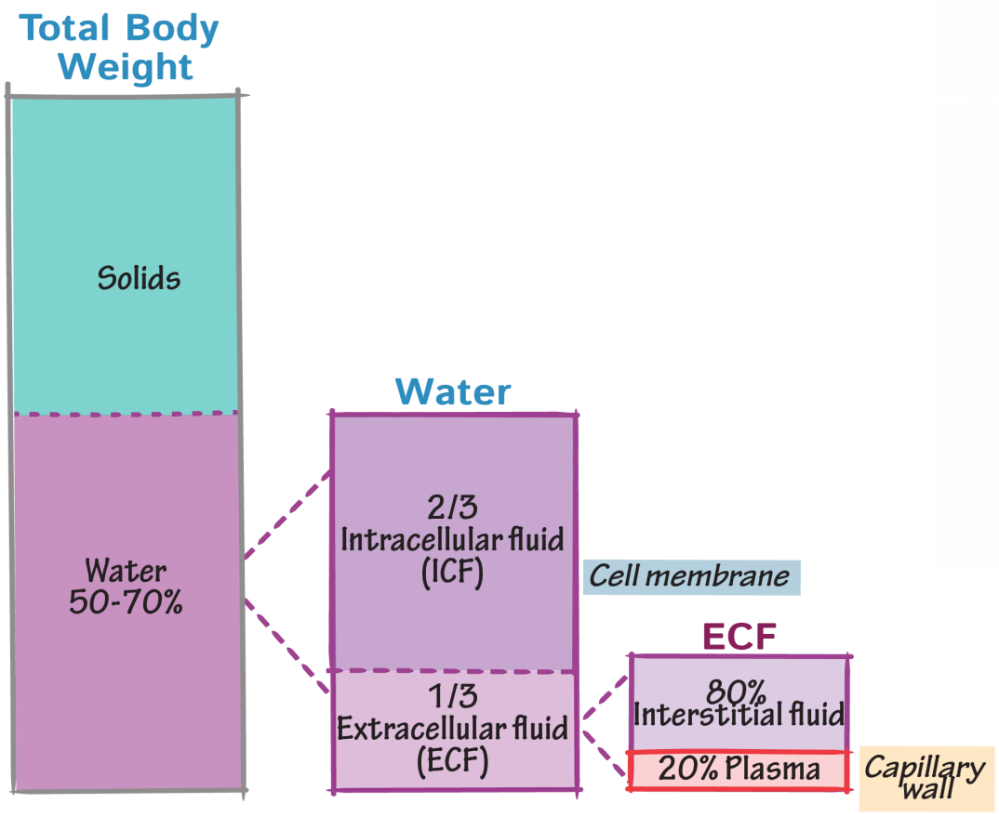
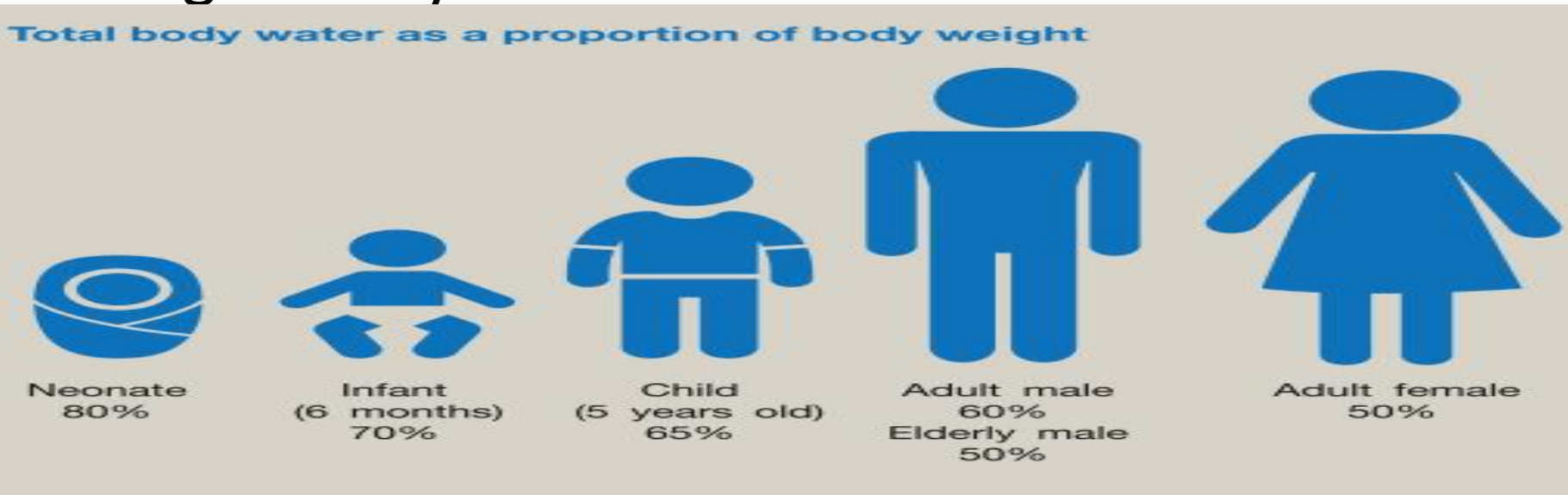
Body fluid and electrolyte



- The fluids of the body are primarily composed of water, which in turn contains a multitude of substances includes:
- Electrolytes such as sodium, potassium, magnesium, phosphate, chloride, etc.
- Metabolites, such as oxygen, carbon dioxide, glucose, urea, etc.
- Proteins, such as coagulation factors, immunoglobulin's, albumin, and various hormones.

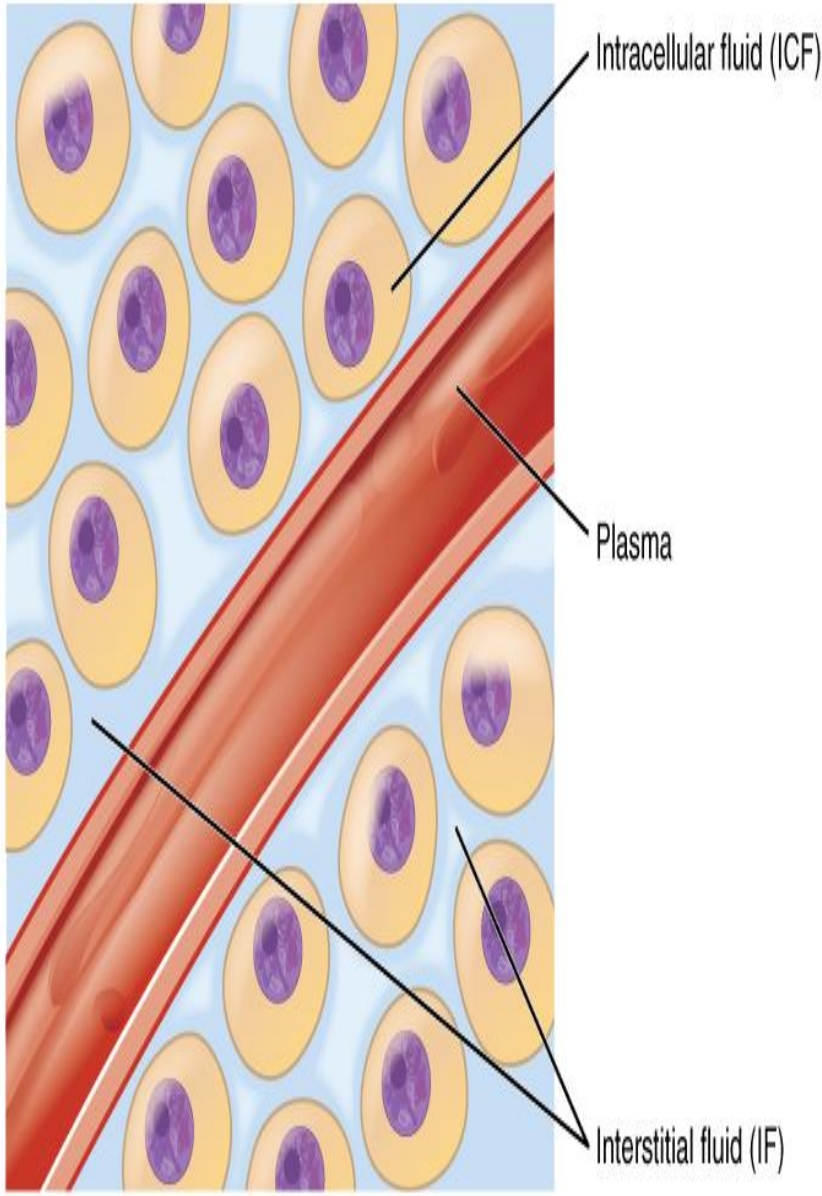
- The distribution of the various fluid compartments in the body is paramount for the maintenance of health, function, and survival.
- For the average 70 kg man, 60% of the total body weight is comprised of water, equaling 42L.
- This percentage can change, depending on age, gender, and degree of obesity. As a person grows older, the percentage of total body weight that is fluid gradually decreases.

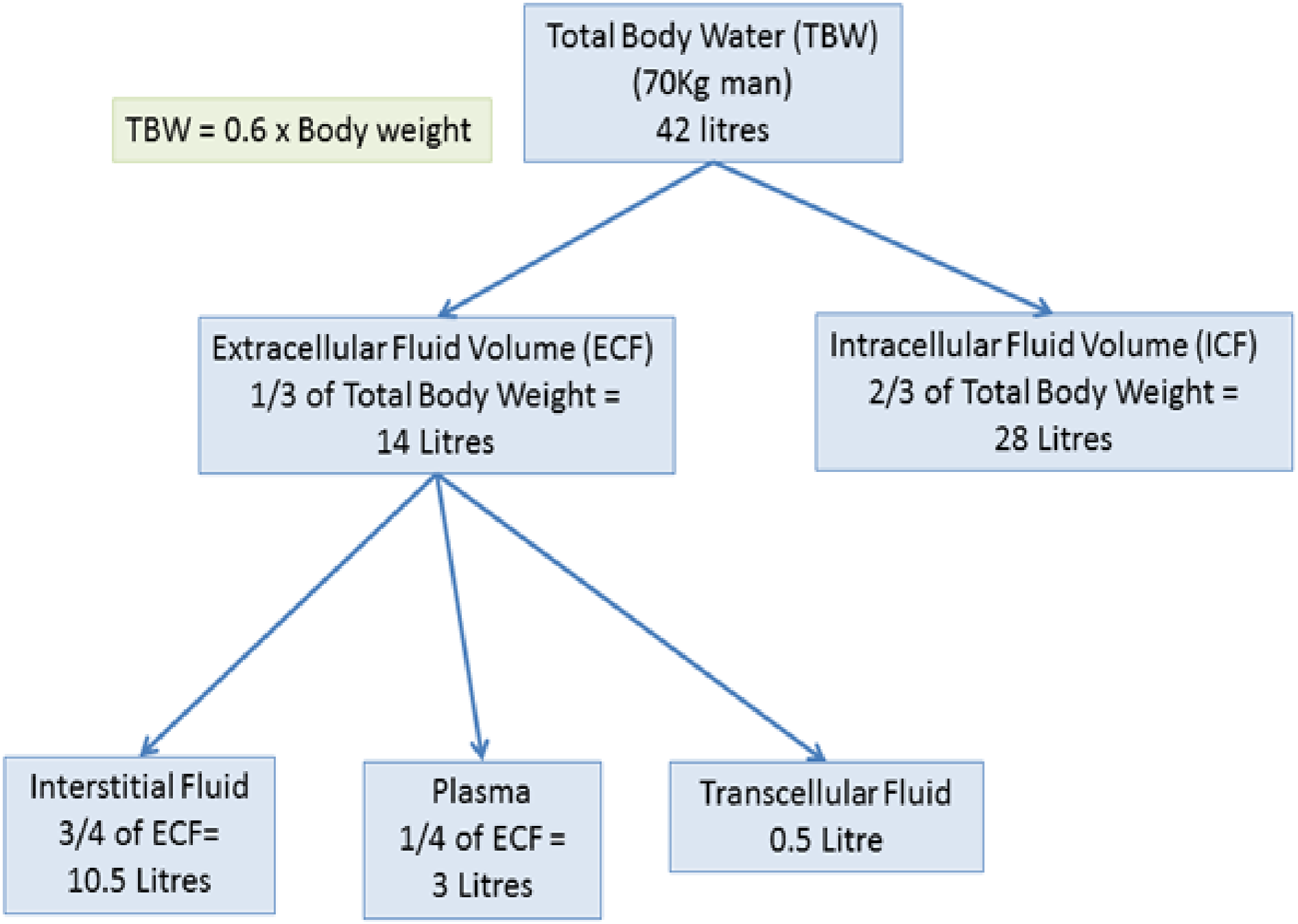


- Aging is usually associated with an increased percentage of the body weight being fat, which decreases the percentage of water in the body.
- Because women normally have more body fat than men, they contain slightly less water than men in proportion to their body weight.

- The body's fluid separates into two main compartments
- Intracellular fluid volume (ICFV) two-thirds (2/3)
- extracellular fluid volume (ECFV). One-third (1/3)

- The ECFV is comprised of two spaces: The interstitial fluid volume (ISFV) and the plasma volume (PV).




Total Body Water (TBW)
(70Kg man)
42 litres
TBW = 0.6 x Body weight
Extracellular Fluid Volume (ECF)
1/3 of Total Body Weight =
14 Litres
Intracellular Fluid Volume (ICF)
2/3 of Total Body Weight =
28 Litres
Interstitial Fluid
3/4 of ECF=
10.5 Litres
Plasma
1/4 of ECF =
3 Litres
Transcellular Fluid
0.5 Litre

- Plasma is the only fluid compartment that exists as a real fluid collection all in one space. It differs from the interstitial fluid by its higher protein content and its function in transportation.

- ingestion and excretion of water and electrolytes are under tight regulation to maintain consistent total body water (TBW) and total body osmolarity (TBO).

Daily Intake of Water

Water is added to the body by two major sources:

(1) it is ingested in the form of liquids or water in the food, which together normally add about 2100 ml/day

(2) it is synthesized in the body as a result of oxidation of carbohydrates,

Daily Loss of Body Water

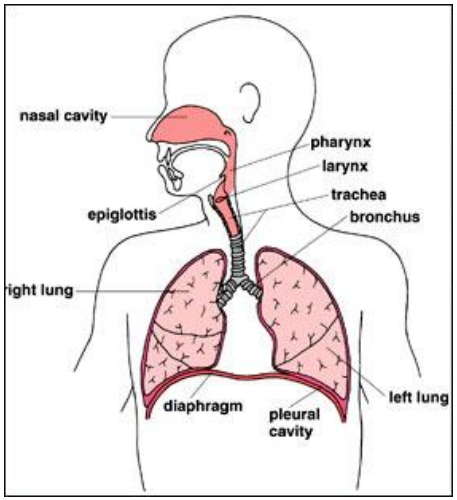
1- there is a continuous loss of water by evaporation from the respiratory

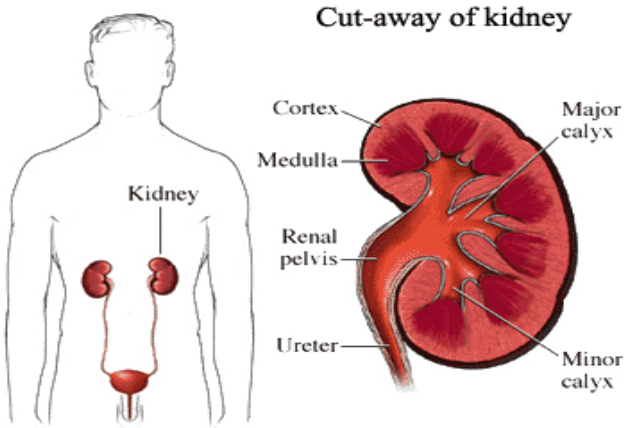
2- The water loss through the skin occurs independently of sweating.

3- Water Loss in Feces. Only a small amount of water normally is lost in the feces.

4- The remaining water loss from

the body occurs in the urine excreted by the kidneys





Circulation of body fluids

- Body fluids are circulating inside the body to transport nourishment to the cells. Blood circulates inside the blood vessel by the pumping of the heart. The rate of blood flow varies from 0.1 to 1.0 m s^{-1}, depending on the diameter of blood vessel.

Samples Obtained from Biological Fluids

- Body fluids such as blood, cerebrospinal fluid and saliva contain cells as a normal component. However, in other fluids cells are a contamination. Cells in urine may indicate a disease process.
- The study of enzymes in such fluids also requires separation of the two compartments (cells from biological fluid).
- a simple centrifugation step (5000 *g* for 15 min) which will produce a pellet containing most of the cellular material. The supernatant produced by centrifugation can be assayed for enzymatically active proteins.

Electrolyte

- Electrolytes are solute compounds that do separate into charged particles called ions
- In nutrition, the term refers to essential minerals found in blood, sweat and urine.

- When these minerals dissolve in a fluid, they form electrolytes — positive (Cations) or negative (Anions) ions used in metabolic processes.

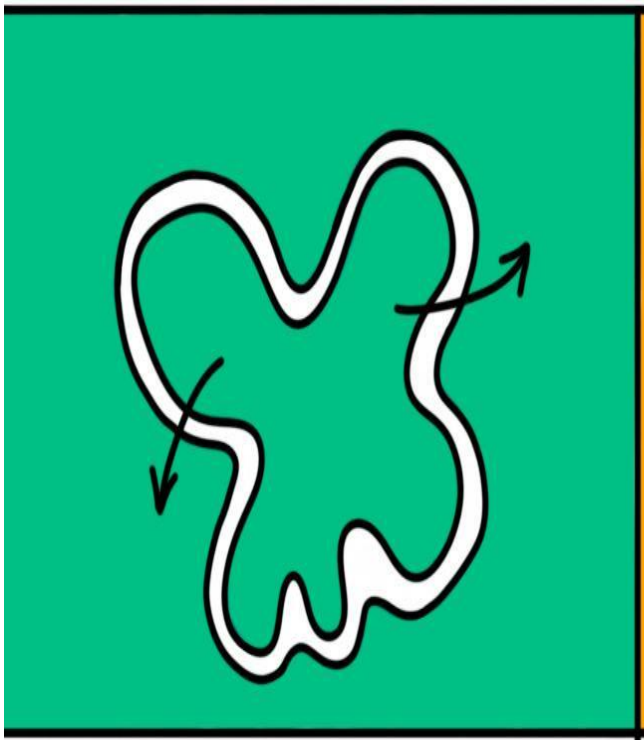
Electrolytes found in body include:

Solutes	*Plasma mEq / L*	*Interstitial fluid (mEq/L)*	*Intracellular fluid (mEq/L)*
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

- These electrolytes are required for various bodily processes, including proper nerve and muscle function, maintaining acid-base balance and keeping you hydrated.

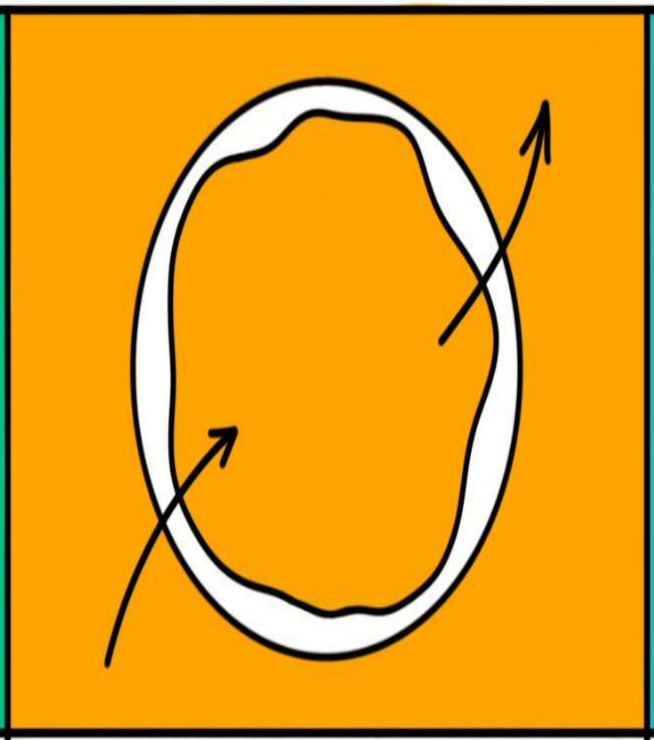
- Dehydration is a hypertonic ECF deficit. When water loss is greater than electrolyte loss or when more electrolytes are taken in the remaining fluid in hypertonic.Water moves out of the cell to dilute the ECF Causes of dehydration include hyperglycemia, diarrhea, sweating

The Importance of Osmoregulation



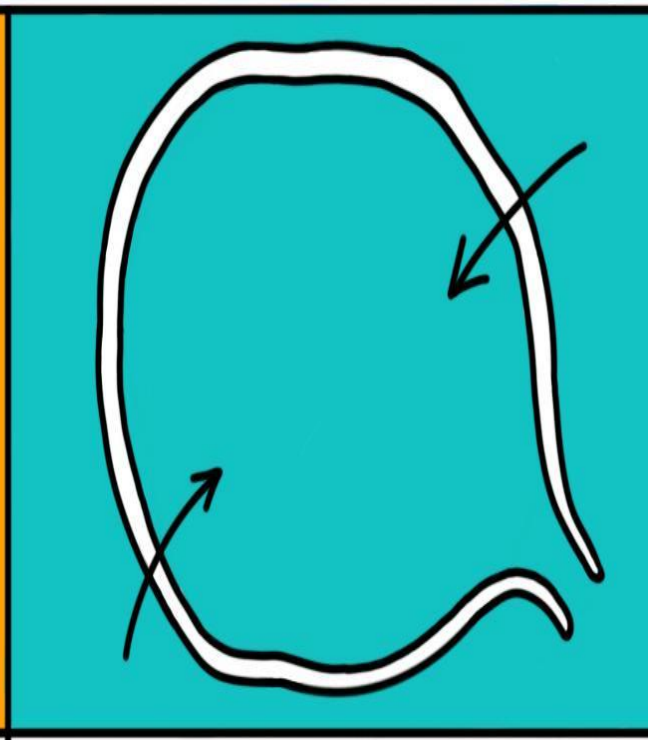
Hypertonic Solution

The solution outside of the cell is more concentrated than the inside of the cell. Water will move out of the cell by osmosis, causing it to shrink.



Isotonic Solution

The solution inside the cell has the same concentration as the outside of the cell. Water will move in and out of the cell at an equal rate.



Hypotonic Solution

The solution outside of the cell has a lower concentration than the inside of the cell. Water will move into the cell by osmosis, sometimes causing it to burst.

- Assessment of Dehydration
- 1-Flushed Skin
- 2-Dry mucous membranes
- 3-Increased body temperature
- 4-Weight Loss