

Water and Electrolytes

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Slide 1



Water

- 50 – 70% of a healthy adult's body is composed of water
- About 2/3 of this water is within body cells (intracellular fluid)
- The remaining 1/3 is between cells and in blood plasma (extracellular fluid)



Water

An adult man contains about 49 litres of water.

25 litres are intracellular fluid

15 litres are extra cellular fluid

The main cation in the (ICF) is potassium accompanied by magnesium and phosphate

The main cation in the extra cellular fluid (ESF) is sodium and chloride



Functions of Water

- Dissolves and transport substances
- Makes up the majority of blood volume
- Helps maintain body temperature
- Protects and lubricates body tissues



Functions of Water

- The non equal distribution and diffusion of ions between ECF and ICF produces an electric charge across the cell membrane (about 80m V).
- This membrane potential is important for many cell functions especially in the muscles and nerves.



Variation in Water Levels

- **Tissue type:** lean tissues have higher fluid content than fat tissues
- **Gender:** males have more lean tissue and therefore more body fluid
- **Age:** lean tissue is lost with age and body fluid is lost with it

Lean tissue is the muscle tissue without fat.



Water balance

- There has to be a balance between the water intake and the water output
- To keep the composition of the cell water and extra cellular fluid constant.
- daily water intake should be replaced daily.



water intake

The water intake is from:

- Fluid drunk.
- Water in food eaten.
- Metabolic water: the water formed by oxidation of carbohydrates, lipids and protein.



Regulation of water intake:

Water intakes can be regulated as follows:

- The kidney is the organ that regulated the amount of water in the body.
- The kidneys conserve sodium and potassium concentration by controlling renal reabsorption affected of aldosterone.

Aldosteron: A hormone secreted by the adrenal glands that is important for maintaining salt and water balance in the body



Regulation of water intake

- **Thirst:** Sensation of thirst arises as a result of increase in the concentration of sodium in the blood. Thirst receptors are in the hypothalamus are associated with water depletion and not with salt depletion



Water: Recommended Intake

- Adult women: 2.7L/day
- Adult men: 3.7L/day



Water recommendation

- Water needs vary and it depends on:
 - Type of food (i.e. salty food need more water)
 - The environment temperature and humidity.
 - The activity level of a person.

- Note: both alcohol and caffeine act as diuretics causing the body to lose water

Diuretics are medicines that help reduce the amount of water in the body



Water output

Water output takes place through:

- Urine
- Water in feaces
- Water evaporated through skin and lungs



Electrolytes

- Electrolyte: A substance that disassociates in solution into positively and negatively charged ions and is thus capable of maintaining an electrical charge



Electrolytes

Electrolytes in the body include:

- Sodium
- Potassium
- Chloride
- Phosphorus
- Calcium



Electrolytes

- Electrolytes carry electrical charges:
Sodium and potassium are positively charged

Chloride and phosphorus are negatively charged

Fluids have an overall neutral charge due to the balances between positively and negatively charged electrolytes



Location of Electrolytes

- Potassium and Phosphorus are the predominant electrolytes in intracellular fluid
- Sodium and Chloride are the predominate electrolytes in extracellular fluid



Functions of Electrolytes

- Help regulate fluid and pH balance
- Signal our muscles to contract (Calcium)
- Help nerves respond to stimuli (Sodium and Potassium)



Sodium and potassium content of food

- In meat and fish the ratio of Na/k is 2:3 in both extra and intra cellular fluid.
- Natural food are rich in potassium and low in sodium unless salt is used.
- Processed foods are high in sodium due to the presence of high salt content.



Body deficits

- Body deficits:
 1. Water depletion
 2. Sodium depletion.
 3. Potassium depletion



Water depletion

- **Dehydration means water deficiency and can be due to:**
 - Vomiting
 - Diarrhea
 - Renal failure
 - Loss through skin such as in excessive sweating and burns.



Water depletion

- Evidence of dehydration is:
 - Sunken feature: the eyes recede into the orbit.
 - The skin and tongue are dry.
 - The skin becomes loose and lacks elasticity.
 - The patient is usually but not always thirsty.



Sodium depletion

Sodium depletion.

- The early symptoms are psychological and behavioural and it is usually associated with water depletion.



Potassium depletion

Potassium depletion

- The main features of potassium deficiency are:
 - Muscular weakness
 - Mental confusion.