

## Introduction

Only 4% of human body weight is composed of *minerals* (they are inorganic elements). The other 96% is composed of water and (carbohydrates, proteins, and fats). When plant or animal tissue is burned, the ash that remains is the mineral content.

Minerals are present in the body as *inorganic* compounds in combination with organic compounds and alone. Many minerals have been proven essential to human nutrition, and there are others with unknown essentiality.

#### 1-Water

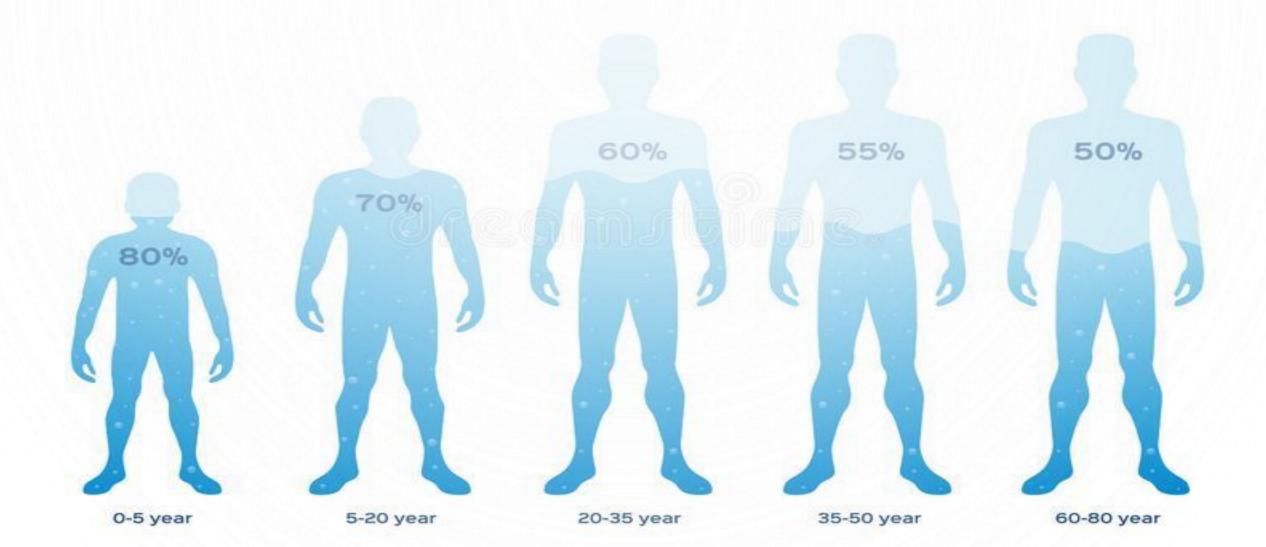
Next to oxygen, water is the most important nutrient for the body. Lack of water causes the cells to become dehydrated. <u>Muscle tissue</u> is relatively high in water content, while <u>adipose (fat) tissue</u> is relatively low.

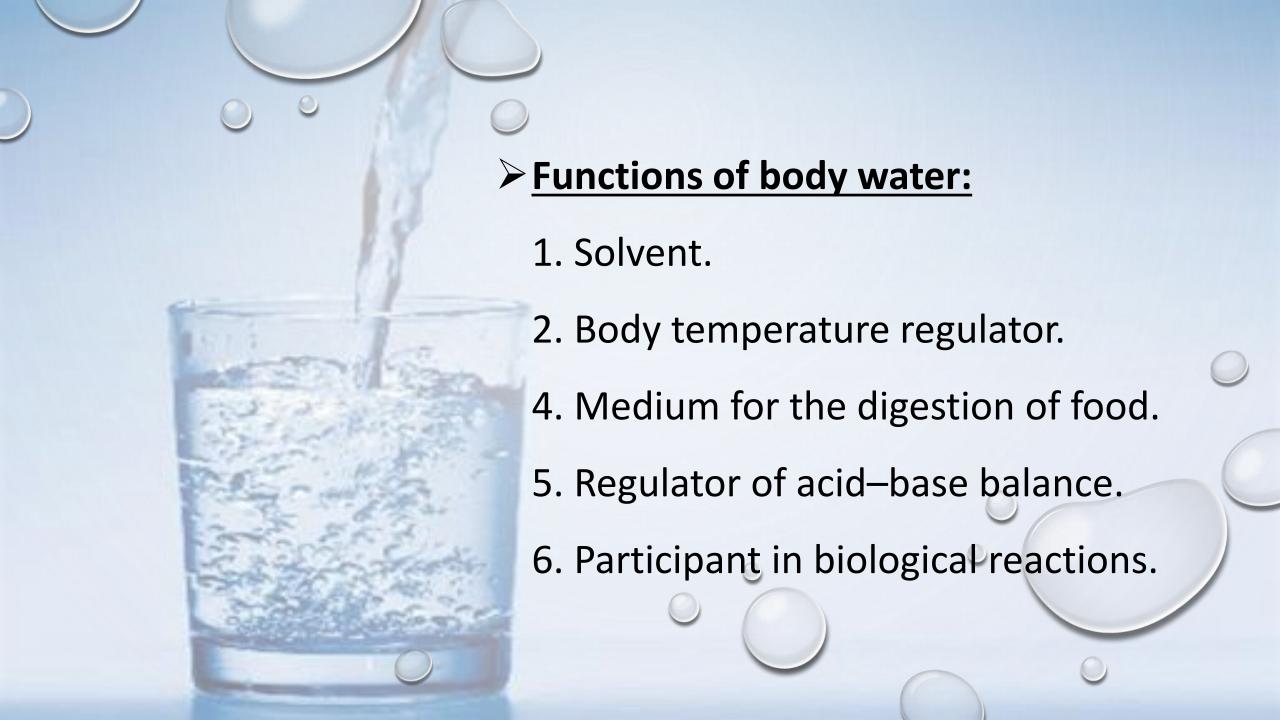
50-60% of adult body weight is water, depending on the amount of fat tissue.

The water content of the body falls with age, unrelated to body weight.

An infant has a higher percentage of body water than an adult. Water beyond one's immediate needs cannot be stored for future use.

# WATER IN HUMAN and AGE





# **▶** Distribution of body water:

1. Extracellular fluid ECF (surrounding the cells): 20 to 25% of the

body water is outside the cells. ECF includes the vascular system.

2.Intracellular fluid ICF (inside the cells): 40 to 45% of the body

water is inside the cells. The ICF contains twice as much water as

the ECF.

# > Source of water:

Obvious dietary sources of water; are water itself and other beverages:

- Nearly all foods contain water.
- Fruits and vegetables contain about 90% water.
- Meats and cheeses contain about 50% water.
- Water is also generated during metabolism.

# > Loss of Water from the body :

In a normal person, daily water intake equals output.

- 1. Most water is lost through the kidneys as urine.
- 2. Water is lost from skin as Sweating.
- 3. Water is lost from the **lungs in breathing**.
- 4. Water is lost in the feces.
- 5. Certain disease and injury (acute diarrhea, burns, and blood losses).

## > Daily requirements for water :(where 1 liter ~ 4 cups):

- A newborn baby: 0.7 liter a day
- A 30-year-old man: 3.7 liters a day
- A 30-year-old woman: 2.7 liters a day
- A 30-year-old pregnant woman: 3.0 liters a day
- A 30-year-old nursing mother: 3.8 liters a day



### 2- Minerals

Minerals vary widely in the amounts the body will absorb and excrete. Some minerals require the presence of other minerals in the body to function properly. Some minerals are transported by carriers in the body. Most minerals are toxic when ingested at

### Minerals are:

- 1-A part of the structure of all body cells.
- 2. Components of enzymes, hormones, blood, and other vital body compounds.

### 3. Regulators of:

- a. acid-base balance of the body.
- b. response of nerves to stimuli.
- c. muscle contractions.
- d. cell membrane permeability.
- e. osmotic pressure and water balance

### **Classifications of Mineral**

#### A- The macro-minerals are:

calcium (Ca), phosphorus (P), potassium (K), sodium (Na), sulfur (S), magnesium (Mg), and chlorine (Cl).

#### **B- The microminerals are:**

iron (Fe), zinc (Zn), manganese (Mn), fluorine (F), copper (Cu), cobalt (Co), iodine (I), selenium (Se), chromium (Cr), and molybdenum (Mo).

Microminerals are frequently referred to as "trace elements" because they are present in the body in such small quantities (less than 0.005% of body weight).

These essential trace elements are required daily in the body in the milligram range.

#### a. CALCIUM

Calcium is the mineral present in the largest amount in the human body. 99% of it is found in the <u>bones and teeth</u>. The remainder (1%) is in body fluids, soft tissue, and membranes.

The absorption of calcium depends upon body need, vitamin D, the amount of calcium in the body fluids, ratio of calcium to phosphorus, and the acidity of the gastrointestinal tract. Calcium is stored in the bones and teeth, it is excreted via feces and urine.

| Mineral    | Functions  | Food Sources                    | Results of Deficiency | RDA (mg/daily) Male & female |
|------------|--|---------------------------------|-----------------------|------------------------------|
|            | -Aids bone and tooth formation.                                    | milk and cheeses yogurt, meat,  | -Rickets              | 30 years:                    |
|            | -Maintains serum calcium levels.                                   | egg (yolk), green leafy         | -Osteoporosis         | 1000mg                       |
| Calcium    | -Aids blood clotting.  | vegetables, legumes, nuts and   | -slow blood clotting  |                              |
| (Ca)       | -Aids muscle contraction and relaxation.                           | whole grains                    | -poor tooth formation |                              |
|            | -Aids transmission of nerve impulsesMaintains normal heart rhythm. |                                 |                       |                              |
|            | -Aids bone and tooth formation.                                    | Meat                            | -Rickets              | (19–30 y):                   |
|            | -Maintains metabolism of fat and                                   | cheeses (especially cheddar),   | -Osteoporosis         | 700 mg                       |
| Phosphorus | carbohydrates.   | peanuts, beef, fish, eggs, milk | -slow blood clotting  |                              |
| (P)        | - control pH of the blood.   | and milk products               | -poor tooth formation |                              |
|            |  | Vegetable/Fruit, wheat, oats,   |                       |                              |
|            |  | barley, rice Other carbonated   |                       |                              |

| Mineral          | Functions  | Food Sources  | Results of Deficiency  | RDA (mg/daily) Male & female     |
|------------------|--|---|--|----------------------------------|
| Sodium<br>(Na)   | Normalizes osmotic pressure.  Balances acid base. Regulates nerve impulses.  Regulates muscle contraction.   | protein foods (fish, meat, eggs) processed foods: any containing baking soda, baking powder, spinach, | Hyponatremia, nausea, headache, anorexia, muscle spasms, mental confusion, fluid and electrolyte imbalance | 24-year-old<br>adult:<br>2000 mg |
| Potassium<br>(K) | Maintains protein and carbohydrate metabolism.  Maintains water balance.  Normalizes osmotic pressure.  Balances acid base. Regulates muscle activity. | Vegetable/Fruit Group,  | Hypokalemia, fluid and electrolyte imbalances, tissue breakdown  | (19–30 y):<br>4.7mg              |

|  | Mineral       | Functions                             | Food Sources              | Results of Deficiency   | RDA (mg/daily) Male<br>& female |
|--|---------------|---------------------------------------|---------------------------|-------------------------|---------------------------------|
|  |               | Assists in regulation of body fluids. | grains, green vegetables, | fluid and electrolyte   | Male (19–30 y):                 |
|  |               | Activates enzymes.                    | soybeans, milk,           | imbalance               | 400 mg                          |
|  | Magnesium     | Regulates metabolism of               | meat, poultry             | skin breakdown          | Female(19-                      |
|  | (Mg)          | carbohydrate, fat, and protein.       |                           |                         | 30y):                           |
|  |               | Works with Ca, P, and vitamin D in    |                           |                         | 310 mg                          |
|  |               | bone formation.                       |                           |                         |                                 |
|  |               | Aids in maintaining                   | table salt (60% chloride) | Intake is not usually a | (19–30 y):                      |
|  | Chlorine (CI) | fluid electrolyte balance and         |                           | problem                 | 2.3mg                           |
|  |               | acid-base balance.                    | meats, eggs, milk         |                         |                                 |
|  |               | Aids in digestion and                 |                           |                         |                                 |
|  |               | absorption of                         |                           |                         |                                 |
|  |               | nutrients.                            |                           |                         |                                 |

| Mineral    | Functions                          | Food Correspond                    | Results of         | RDA (mg/daily)  |
|------------|------------------------------------|------------------------------------|--------------------|-----------------|
| Mineral    |                                    | Food Sources                       | Deficiency         | Male & female   |
|            | Formation of hemoglobin.           | liver, kidneys, lean               | iron-deficiency    | Male (19–30 y): |
|            | Is found in (myoglobin)the iron    | meats, whole grains,               | anemia             | 8mg             |
| Iron (Fe)  | protein molecule in muscles.       | enriched breads, cereals, legumes, |                    | Female(19-      |
|            |                                    | almonds dried fruit: prunes (and   |                    | 30y): 18mg      |
|            |                                    | juice), raisins, apricots          |                    |                 |
|            | Basic component of                 | lodized salt (major                | cretinism (stunted | (19–30 y): 150  |
|            | thyroxin, a hormone in the thyroid | source)                            | growth, dwarfism)  | mg              |
|            | gland that regulates the           | seafood: salt water fish           | goiter             |                 |
|            | basal metabolic                    |                                    | (enlargement of    |                 |
| lodine (l) | rate (BMR).                        |                                    | thyroid gland)     |                 |
|            | Contributes to normal growth       |                                    |                    |                 |
|            | and                                |                                    |                    |                 |
|            | development of the body.           |                                    |                    |                 |

| Mineral   | Functions  | Food Sources                             | Results of Deficiency                                      | RDA (mg/daily) Male & female                |
|-----------|--|--|--|---|
| Zinc (Zn) | metabolism.  Affects normal sensitivity to taste and smell.  Promotes wound healing.  May help in the treatment of acne. |  | associated with extreme malnutrition impairs wound healing | Male (19–30 y): 11mg Female (19–30 y): 8mg  |
|           | Protects against dental caries.  | seafood<br>fluoridated drinking<br>water | of tooth decay   | Male (19–30 y):  4mg Female (19–30 y):  3mg |

