Water

Water

The following subtopics will be discussed:

- Explain the main functions of water in the human body.
- Explain the daily water intakes and losses for an adult human being
- Outline the major sources of body water.
- Outline the main locations of water with their percentages in the human body

Water

The following subtopics will be discussed:

- Outline the main factors influencing water intakes and individual variations.
- Outline the main locations of water in the human body (and their percentages).
- List the consequences (diseases) linked to the deficiency of water in the human body.
- Calculate the total amount of water of adult human being and show its quantitative distribution in different locations

Water

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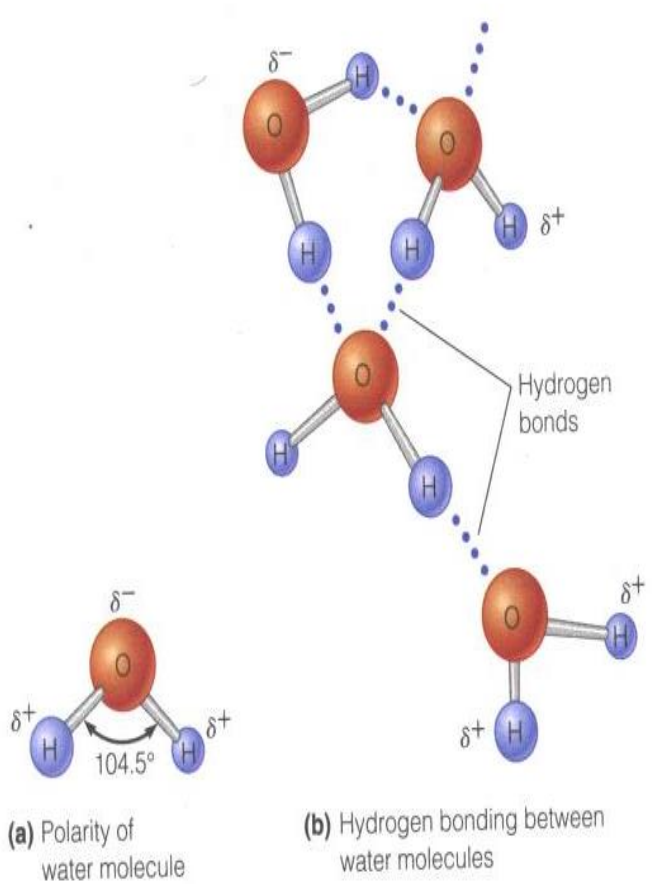
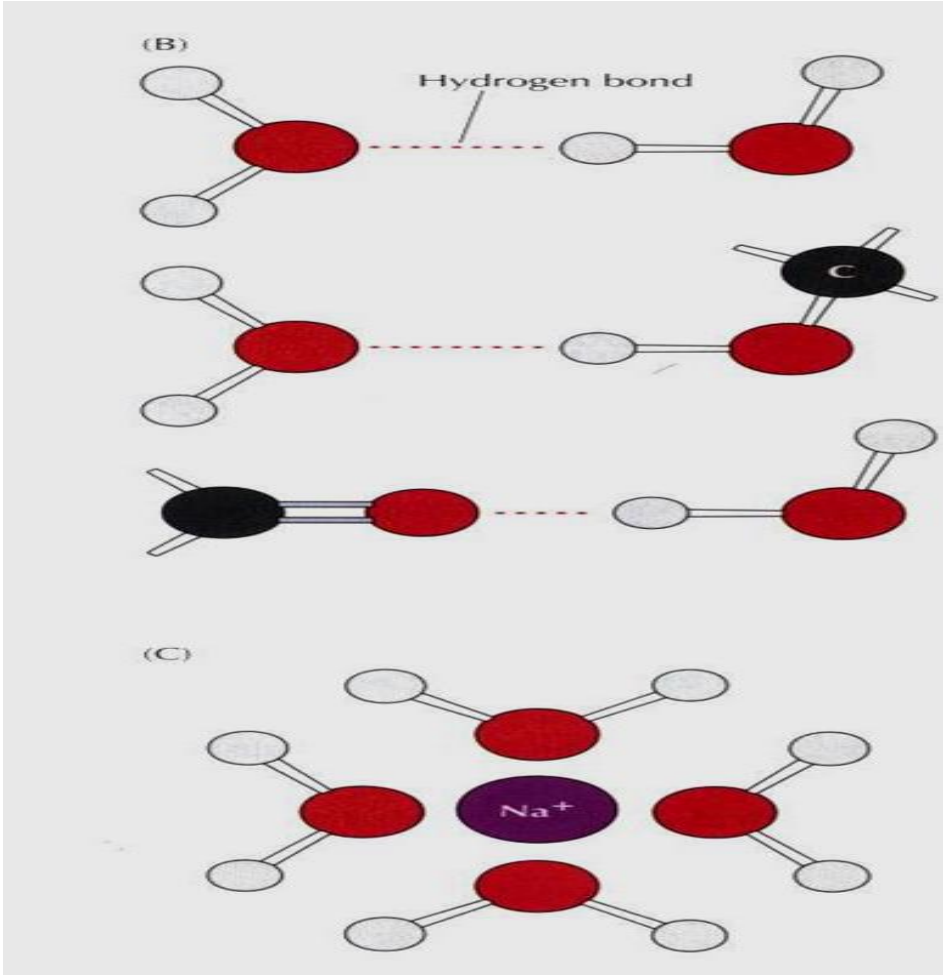


(a) Polarity of water molecule

(b) Hydrogen bonding between water molecules



Water

- Water is a major component of the human body mass.
- Depending on the conditions, a person can only survive a few days without water.
- No other nutrient deficiency has such a profound effect on human health.
- Without water, a number of essential body functions are disrupted or stop altogether: *blood pressure increases, the heart begins to malfunction, and kidneys shut down*.

Water

Water is the largest single constituent of the human body where it makes 2/3 of the total body weight. But the total body water content varies with age, gender and the number of fat cells. The average adult human body is 50-65% water (*averaging around 60%).*

Most of water is contained inside the living cells. In fact, the body's billions of cells must have water to live.

Water

The percentage of water in infants is much higher, typically around 75-78% water, dropping to 65% by one year of age.

Body composition varies according to gender and fitness level, because fatty tissue contains less water than lean tissue.

How much water should i drink per day?

It is important to keep in mind that water requirements can vary from one person to another and depend on several factors: physical activity, ambient temperature, health status (fever, diarrhoea, bleeding injury), physiological condition (pregnancy, lactation), age and gender, among other things.

Factors influencing water intake per day

Water needs vary widely among individuals and depend on a number of factors influencing water intake per day:

(i) Level of physical activity

(ii) Environment

(iii) Illness/disease state

(iv) Pregnancy or breastfeeding

(v) Gender and (vi) Age

(vii) Over hydration or water toxicity

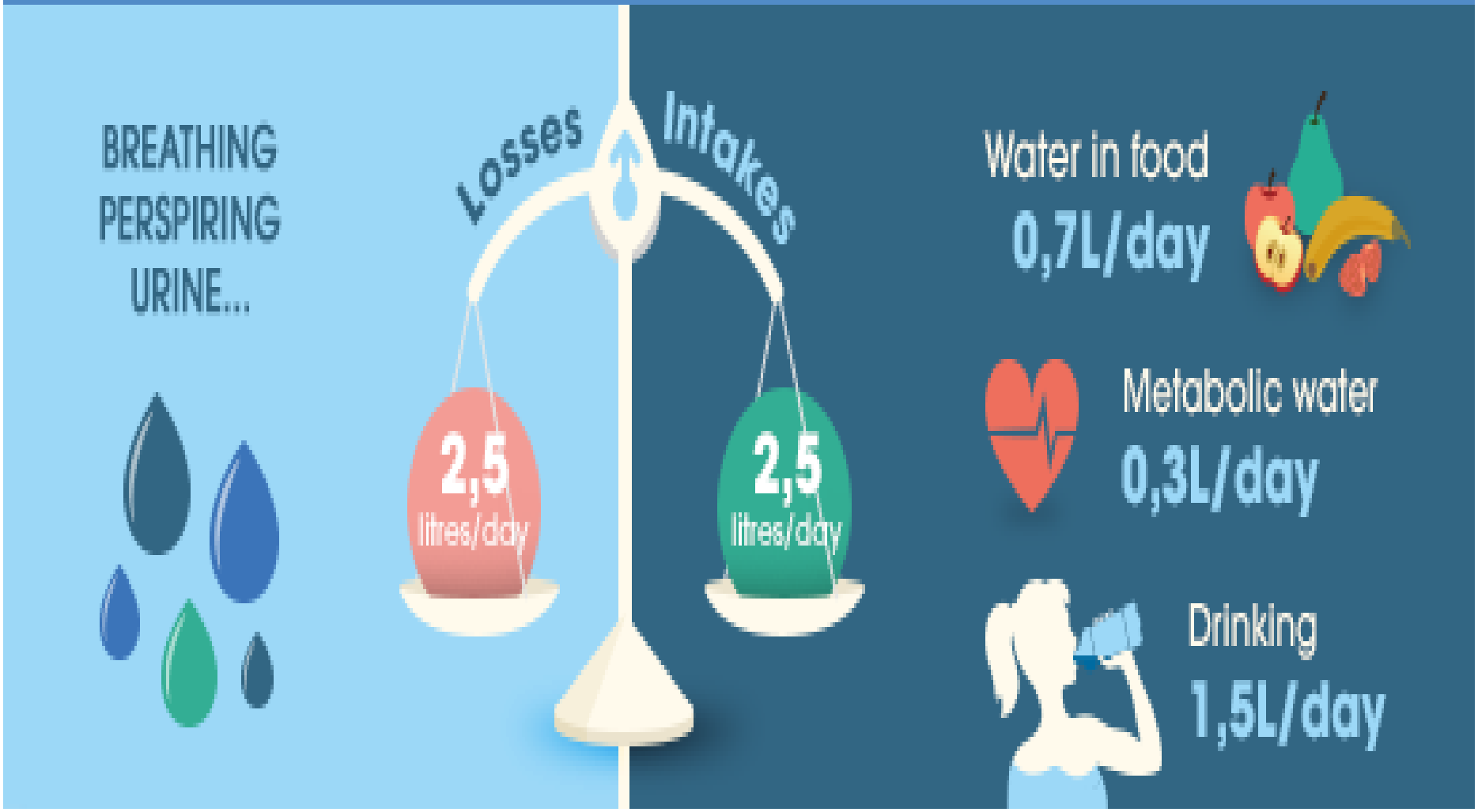
How much water should I loose per day?

An adult human being with normal physiological conditions in a temperate climate (18°C – 25°C), losses on average 2.5 liters of water per day:

- Kidneys through urine excretion (1.5 L)
- Lungs by breathing (0.35 L)
- Skin by perspiring (0.45 L)
- Intestines in the form of faeces (0.2 L)

To avoid dehydration we need to ingest as much water as we loose.

HOW MUCH WATER SHOULD I DRINK A DAY?



How much water to drink & lose per day?

The daily water intake and loss is 2.5 L/day. But people should keep in mind that this is an estimation, the individuals need to consider their own activity levels, age, gender and the climate they live in and they should replace fluids according to their own needs.

Functions of water in the human body

Functions of water in the human body

Water is one of the essential nutrients that must be consumed regularly, as the body does not produce the amount needed without utilizing external sources in the form of dietary intake.

Deprivation of water will kill an individual faster than being deprived of any other nutrient. This important liquid is a vital component of most major body components.

Functions of water in the human body

The human body uses water in all its cells, tissues and organs to help regulate its temperature and maintain other bodily functions.

Because the body loses water through breathing, sweating and digestion, it is important to rehydrate by drinking fluids and eating foods that contain water.

Water helps to regulate body temperature

Water has a large heat capacity which helps limit changes in body temperature in a warm or a cold environment. Water enables the body to release heat when ambient temperature is higher than body temperature (2): we begin to sweat, and the evaporation of water from the skin surface cools the body very efficiently.

Locations of water in the human body

The 2 main locations of water are:

- *Intracellular area*= 2/3 (**67 %**) of total body water
- *Extracellular area*= 1/3 (**33** %) of total body water

Locations of water in the human body

The sub-locations of water are found in the extracellular area:

- *Interstitial fluid* (including lymph), which is an aqueous medium surrounding cells ≃ **71 %** of extracellular water
- *Blood plasma* ≃ ***21*** **%** of extracellular water
- *Transcellular fluid* (cerebrospinal fluid, ocular, pleural, peritoneal and synovial fluids) ≃ **8** % of extracellular water

Location of water in the human body

Example: an adult human being with a weight of 70kg. The total body water is (70*60)/100= 42 L

S/N	Main locations	Sub-locations	Percentage (%)	quantity (L)
1	Intracellular 2/3	Intracellular	**67 %** of total body water)	28 L
2	Extracellular 1/3	Extracellular (total)	**33 %** of total body water)	14 L
		Interstitial fluid	**71 %** of total extracellular water	10
		Blood plasma	**21 %** of total extracellular water	3
		Transcellular fluid	**8 %** of total extracellular water	1

Functions of water in the human body

water as ‘universal’ solvent of biological systems:

75-85% of the typical cell weight is H_2O.

Polarity is the result of an uneven distribution of electrons within a molecule’s structure. Polarity of water allows formation of hydrogen bonds between water molecules or with other polar molecules. Membrane components interact with the polar nature of water to determine cell boundaries.

Functions of water in the human body

A major component of our body mass.

A person can only survive a few days without water.

Without water:

- ✓ Blood pressure rises
- ✓ Heart begins to malfunction
- ✓ Kidneys shut down

Functions of water in the human body

- Transportation
- Structural
- Regulation
- Lubrication

Functions of water in the human body

Transportation:

- Nutrients
- Wastes
- Hormones
- Enzymes
- Platelets
- Blood cells

Functions of water in the human body

Lubrication:

- Joints
- Digestive tract
- Food (saliva)
- Mucous membranes

Functions of water: Lubrication:

Water, combined with other substances in the body, makes lubricating fluids in your body. These fluids serve a number of purposes including:

- Lubricating joints to reduce friction and wear-and-tear on joint tissues, and
- Lubricating mucous in the digestive tract to assist in the movement of food.

Functions of water: Lubrication:

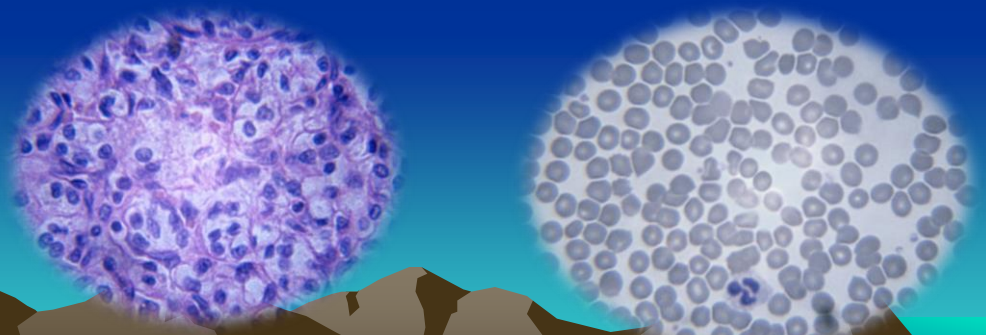
- One of these fluids is saliva, which lubricates food as it passes through the esophagus.
- Fluids also serve to lubricate and protect mucous membranes from infectious agents

Functions of water: Regulation

Water also helps regulate body temperature. Water can absorb heat with relatively little change in water temperature. By absorbing heat from the body and releasing it through perspiration, water is an integral part of the body's best cooling system.

Structural function of water

Water is an important structural unit in the body: it maintains cell shape, is essential to the maintenance of cell membranes, and helps cushion and protect our body's organs.



Everybody leaks

Your body looses between 64 and 80 ounces of fluid each day (1 ounce=30 grams).

How does this happen?

Through normal body functions:

- Perspiration
- Urination
- Bowel movements (defecation)
- Normal exhalation (think about when you exhale in front of a mirror or a cold window… that condensation is water vapor being released from your body).

Replacement of lost water

The human body can store some water, but only in very limited supply. In order for our bodies to function normally, we need to replenish any water losses daily. It is recommended to drink a minimum of 64 ounces daily in order to replace your body's losses.

Replacement of lost water

Keep in mind that this is an estimate and individuals need consider their own activity levels, age, gender and the climate they live in and replace fluids according to their own needs. There are significant health benefits associated with a high fluid intake including a lower risk of kidney stones, colon cancer and bladder cancer.

Replacement of lost water

Many individuals also find that consuming enough water to replace what is lost each day, helps reduce headaches associated with dehydration.

Did you know that dehydration is the number-one cause of daytime fatigue? People who consume enough water just feel better in general, so replace what you lose each day!

Some good news

Healthy individuals can stay hydrated by consuming water and also juices, milk, coffee, tea, and even soft drinks!

Some fluid is even absorbed from the moisture content of foods!

Some good news

While many people are intimidated by the idea of replacing 2.5 L of water each day, there are some good news: it has been found that healthy individuals can get their required fluids from beverages other than water. That's right!

Some good news

Water in milk, juices, and even caffeinated beverages like coffee, tea, and even soft drinks counts toward a person's total fluid intake. Some fluid is even absorbed by the body from the moisture content of the foods a person eats! This is good news for individuals who choose to drink beverages besides water, HOWEVER…(there are some bad news!)

Some bad news

- Many beverages people consume provide additional calories, sodium and fat.
- Even “diet” soft drinks and teas aren’t perfect: chemical sweeteners may actually stimulate a person’s appetite!
- There is some bad news as well. Many of the beverages that “replace” water in our diet also provide additional calories, sodium and in some cases, fat.

Some bad news

The calories that a person consumes from beverages do not “register” the way that calories from food do. This leaves people who consume calories through beverages without any kind of “full-feeling” or satiety.

These additional calories pave the way to weight gain… an increase of just 100 net calories per day translates to about a 10-pound weight gain over the course of one year.

Some bad news

Diet drinkers beware: your beverages are not much better. Many diet beverages contain chemical sweeteners.

Some studies claim to have found a link between consumption of artificial sweeteners and weight GAIN.

These studies state that the artificial sweeteners may actually **stimulate** a person's appetite!

Healthy beverage options

- An 8 ounce glass of water contains no calories, fat, sugar or sodium.
- 8 ounce of skim milk contains just 90 calories, no fat and a number of beneficial vitamins and minerals.
- 8 ounce of 100% orange juice contains 110 calories, no fat, vitamin C, potassium and folate.

Soft drinks

An 8-ounce serving of a regular soft drink contains about 100 calories, no fat, 27 grams of sugar and no other vitamins or minerals. A can of soft drink contains 12-ounces, a plastic bottle from a vending machine contains 20-ounces, and a large fountain drink from a restaurant may contain up to 44-ounces or more! *(if you are going to use the optional activity, go ahead and demonstrate how much sugar is in the fountain drink now.*

Soft drinks

You may wish to compare the sugar in the drink to the sugar in a candy bar or another sweet, sugary treat.)

It takes roughly 4 grams of sugar to equal one teaspoon… how many teaspoons are in your favorite beverage*? (this question may be used to spark a discussion about the beverages that faculty and staff consume daily, the beverages they consume in front of students, the beverages available in vending machines, or the beverages available in the school cafeteria.)*

What can I do?

Remember that you can get your fluid needs from beverages other than water, but many of those beverages, like some fruit juices, soft drinks, coffee and tea, may also include a number of unwanted ingredients including sugar, sodium and fat.

What can I do?

Try keeping a bottle of water in your car or at your desk to help you increase your daily water intake.

As a goal for the next 2 weeks, try to replace one non-water drink with a glass of water each day. It only takes about 3 weeks to form a new habit so if you can succeed for 2 weeks, why not try to make a new, healthy habit?