THE HUMAN BODY AND NUTRITION
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What do we need to function?

We need nutrients and energy to grow and to perform all our daily activities. We get them through the function of nutrition.

The role of nutrition

During nutrition several different processes take place:

1. **Your body transforms the food you eat into simpler substances called nutrients.**
2. **Nutrients** enter the cell.
3. **Energy** is produced from the nutrients.
4. **Oxygen** is used to convert nutrients into energy.
5. **Waste substances** are released from the cell.

In your cells, the oxygen and the nutrients are converted into energy that your body uses to perform all your vital functions.
There are different systems involved in the process of nutrition:

- Digestive,
- Respiratory
- Circulatory
- Digestive
- Excretory
How our four systems work together

The digestive, respiratory, circulatory and excretory systems are all involved in nutrition.

The **respiratory system** passes the **oxygen** it takes from the air to the **blood**. It also releases **carbon dioxide**, which is a waste substance produced by the cells, out of your body.

The **circulatory system** carries the nutrients and the oxygen to your cells. It also transports waste substances so that they can be released from your body.

The **digestive system** transforms the food we eat into nutrients and passes them to the blood. It also expels the undigested food out of the body as

The **excretory system** consists of the **urinary system** and the **sweat glands**. It eliminates the waste substances produced by the cells and mixes them with water to produce **urine** and **sweat**.
What is the digestive process?

There are three stages in the digestive process:

**DIGESTION**

Digestion is the set of changes that happens to food as it travels along the digestive tract. The objective of these changes is to transform food into nutrients.

**ABSORPTION**

In the absorption stage, the nutrients pass to the blood through capillaries which are found in the villi in the small intestine walls.

**EXCRETION**

The final stage of the digestive process includes the preparation and elimination of the part of our food that our body does not need.

**Glossary**

 secretes: to produce a liquid, such as saliva
 expelled from: removed

capillaries

villus
How food travels inside your body

1. **Digestion** begins in your **mouth**. Your teeth grind the food and your tongue mixes it with saliva from your **salivary glands**. This mixture is called a **bolus**.

2. Next, the bolus passes down the **pharynx** and the **oesophagus** and into the **stomach**.

3. The **stomach** secretes substances called **gastric juices**, which are mixed with the bolus and form a paste called **chyme**.

4. **Chyme** reaches the **small intestine**, where it mixes with other juices from the pancreas, the liver and the small intestine itself, to become **chyle**. This is the beginning of absorption. Nutrients from the food get into the bloodstream.

5. The remains of food that has not been absorbed in the **small intestine** continues its journey to the **large intestine**. There, water is absorbed and the remains are transformed into **faeces** and wait in the rectum to be **expelled** from the body through the **anus**.
Respiration

Through **respiration** we take in the **oxygen** our cells need to transform into energy and our body releases the **carbon dioxide** it doesn’t need.

There are two processes involved in respiration: **pulmonary ventilation** and **gas exchange**.

**Pulmonary ventilation**

**Pulmonary ventilation** is the movement of air into and out of the lungs. This process is performed by two movements: **inhalation** and **exhalation**.

**Inhalation**

During **inhalation**, your diaphragm contracts and your chest cavity expands. This makes your lungs widen and become larger.

1. The air that you take in enters the body through your **nostrils** where it is warmed up and cleaned of impurities by **mucus** and the **fine hairs** inside the nasal cavities.
2. The air then travels through your larynx, into your windpipe, then into your bronchi and your bronchioles and finally reaches your lungs, which are now filled with air.

**Exhalation**

During **exhalation**, your diaphragm relaxes and your chest cavity contracts. Your lungs **deflate** and become smaller. Now, the air goes up through your bronchioles, bronchi, windpipe and larynx and leaves the body through your nostrils.

**Gas exchange**

In your lungs you have **alveoli**. It is here that **gas exchange** occurs. During this process, **oxygen** from the outside air passes into your blood and **carbon dioxide** which is in the blood passes to your lungs and leaves your body.

**Fun fact!**

Spirometers are devices that indicate how much air is in our lungs.

Using a bowl, a clear bottle and a piece of hose you can make your own spirometer.

Look at the picture and build your own. Then, take a breath and blow through the nose. What happens to the water in the bottle?
How air travels around your body

1. Air enters the body through the nostrils.

2. The air travels down through the larynx, the windpipe, the bronchi and the bronchioles, and finally reaches the lungs.

3. Gas exchange takes place in the alveoli.
The circulatory system transports nutrients and oxygen through blood to the cells. It also helps them to get rid of waste products.

**Blood**

Blood consists of plasma and blood cells.

- **Plasma.** This is the fluid which your blood cells float in. It also carries the nutrients and waste products.
- If you observe a drop of blood under a microscope, you will see that there are different types of blood cells in it.

**Types of blood cells**

- **Red blood cells.** They transport oxygen and carbon dioxide.
- **Platelets.** They heal wounds and stop you bleeding.
- **White blood cells.** They defend your body from microorganisms and viruses.
Blood vessels

Inside your body there are three types of blood vessels:

Veins
These are the vessels which carry blood to your heart.

Arteries
These are the vessels which carry blood away from your heart.

Capillaries
These are very narrow vessels that connect arteries and veins. They allow the exchange of gases and substances to take place in the cells.
The heart

The heart is a muscular organ with four chambers: two atria and two ventricles. The atria and the ventricles communicate through valves. The heart contracts and expands to push blood around the body through beating. Each beat has two phases:

- **Systole.** The heart contracts and sends blood to the arteries.
- **Diastole.** The heart relaxes and blood enters from the veins.

How your blood moves around your body

**Blood circulation** is the journey that your blood takes around your body. This journey is divided into two circuits or routes:

- **Pulmonary circulation.** This is the route that your blood takes from the heart to the **lungs**, and back again.
- **General circulation.** This is the route your blood takes around the rest of your body.

In the **lungs** the blood collects **oxygen** from the air. The oxygenated blood leaves the lungs and travels to the heart through the **pulmonary veins**.

Blood carrying **carbon dioxide** enters the heart through the **vena cava** and is sent along the pulmonary arteries to the lungs to release carbon dioxide out of the body.

The heart sends the oxygenated blood to the rest of the body through the **aorta artery**.

When the blood enters the **small intestine**, it collects the digested **nutrients**. The blood delivers the nutrients and the oxygen to the cells. It also collects carbon dioxide and waste substances that the cells have produced.

The blood transports the **waste substances** to the **kidneys** which filter and clean it.
The excretory system consists of the urinary system, and the sweat glands.

**The urinary system**

The urinary system consists of the kidneys, the ureters, the bladder and the urethra.

The filtered waste substances in the kidneys are mixed with water to make urine. This leaves the kidneys through the ureters and accumulates in the bladder. When the bladder is full, urine is expelled from the body through the urethra.

**Kidneys.** These are two bean-shaped organs that filter the blood and return the clean blood back to the circulatory system.

**Ureters.** These are two tubes that link the kidneys to the bladder.

**Bladder.** This is a muscular cavity where urine is stored. It is shaped like a bag.

**Urethra.** This is a tube which links the bladder to the exterior.
Sweat glands

When we do sports or when we get hot, we sweat. **Sweat** is a mixture of water and waste substances, and it is produced in the **sweat glands** in your skin.

Each sweat gland is formed by a large **tube**. The lower end of the tube acts as a **filter**, and at the top of the tube there is a **pore** that opens up to the outside.

The **functions** of the sweat glands are:

- **To filter blood.** They collect **waste substances** and water from the cells and expel them from the body as **sweat**.

- **To control body temperature.** When it is hot, we sweat. This causes our body to cool down.

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**Fun fact!**

If you’re going to do exercise, wear light clothing and remember to drink water before, during and after exercise. Also avoid doing sports during the hottest parts of the day. **Dehydration** is a serious health danger. Do you know what the signs of dehydration are? And how to prevent it?
Nutrition: mind map

Nutrition

- The digestive system
  - digests food
  - converts food into nutrients

- The circulatory system
  - transports nutrients and oxygen to the cells
  - collects waste substances from the cells

- provides the organism with
  - water
  - nutrients
  - oxygen

- The respiratory system
  - takes in oxygen
  - releases carbon dioxide

- The excretory system
  - releases waste substances as urine and sweat