12. The Muscular System and Digestive System in Human Beings

Let's recall.

1. What is meant by 'organ system'?
2. How are the bones in our body joined to each other?

Muscular system

Try this.

Close your fist tightly and bend your arm at the elbow. Now feel the upper part of this arm with the fingers of your other hand. What did you experience?

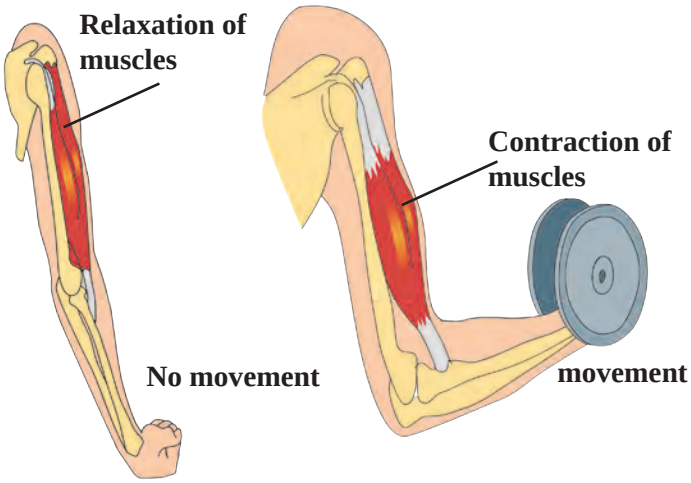
Did you feel the hardness in the upper arm ? This fleshy part consists of muscle. Muscles contract and relax as different parts of our body move. Muscles give our body a specific shape and posture.

Muscles are bundles of fibres that can contract and relax as required.

Can you tell ? What is the mutual relationship between muscles and bones?

Muscles are firmly attached to bones by means of tendons. When muscles contract, there is movement at the joint and the bones move either nearer to or away from each other.

The action of muscles is necessary for all kinds of movements – from the small movements of eyelids to those that demand great strength as when chopping wood with an axe. We use muscles for various movements like talking, laughing, walking, jumping, throwing, etc.



12.1 Contraction of muscles

Use your brain power!

Which parts of our body are made up only of muscles?

Do you know?

There are more than 600 muscles in the human body. Muscles contribute almost 40% of the weight of a healthy adult human body. There are about 30 muscles in the human face. Our eyes, mouth and nose are encircled by small muscles. Expressions like happiness, sadness, fear are expressed by the movements of these muscles of the face.

Can you tell ?

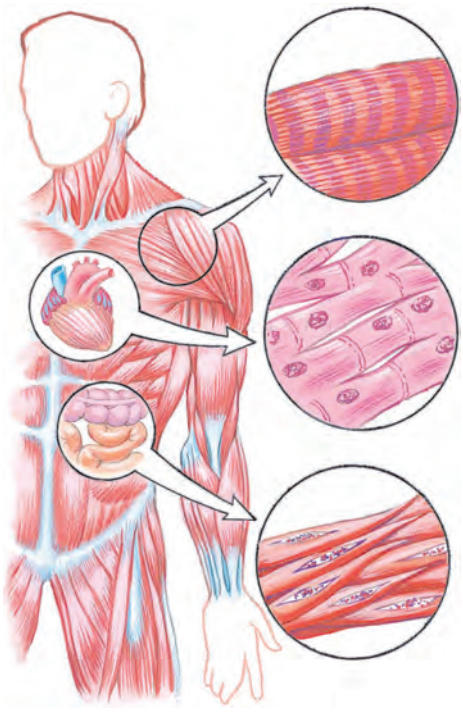
Are the muscles of the different organs in our body identical?

1. Voluntary muscles : Working with our hands, walking, eating, etc. are functions that depend upon our will. Muscles used in these actions are called **voluntary muscles**. For example, muscles in our arms and legs are voluntary muscles.

2. Involuntary muscles : Various processes like breathing, blood circulation, digestion are vital functions, i.e., they are essential for life. They do not depend upon our will. The muscles of organs which carry out these involuntary functions are called **involuntary muscles**. Functions of organs like the stomach, intestine, heart are carried out in their own fixed manner by involuntary muscles.

Which organs in our body have voluntary muscles and which ones have involuntary muscles? Find out and make a list of each type.

Types of muscles



12.2 Muscles in the human body

1. Skeletal muscles : The two ends of each of these muscles are attached to two different bones. Examples of such muscles are muscles of the arms and legs. Their movements are voluntary. They are also responsible for holding the bones of the skeleton together and giving shape to our body.

2. Heart or cardiac muscles : These muscles bring about the contraction and relaxation (beating) of the heart. Their movement is involuntary. Cardiac muscles cause our heart to relax and contract continuously at a rate of about 70 times per minute.

3. Smooth muscles : These muscles are present in the internal organs other than the heart. For example, muscles of the stomach, intestine, blood vessels, uterus, etc. Their movements are involuntary and slow. Various vital functions of our body, of which we remain quite unaware, are carried out by these special muscles.

Can you tell ? How do muscles perform their functions ?

Try this.

1. Hold your arm straight at the elbow (i.e.180°) without closing your fist.
2. Bend the arm at the elbow through 90°.
3. Touch the shoulder with your fingers on same side.

Muscles of which part of your arm contracted and relaxed during the above three actions ?

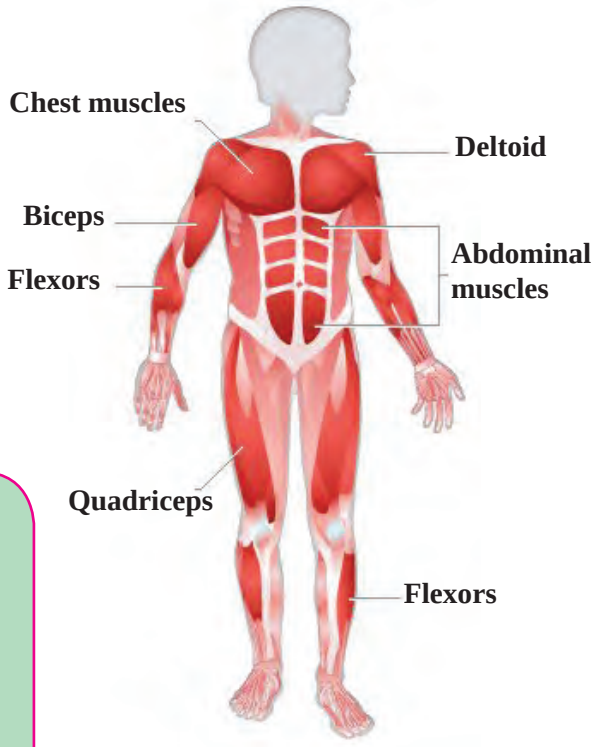
Muscles in our body always work in groups. When some muscles contract, other muscles of the same group, relax. This is how muscles help in the proper performance of the various functions of our body.

The muscle on the front of the bone in our upper arm is called the biceps. The muscle at the back is called the **triceps**.

Use your brain power !

What would happen if :

1. The cardiac muscles do not move.
2. Food enters the stomach and the stomach muscles do not move.



12.3 Muscles in different parts of the body

Always remember –

Muscles of our body must be strong and efficient. Our diet must include proteins and carbohydrates in sufficient quantity for the proper growth and repair of muscles. We must get regular exercise. It makes the muscles strong. We must sit with a straight back, and not with the back hunched or bent. Otherwise, gradually, changes occur in the structure of the vertebrae. Muscles in the shoulder and back begin to hurt. Disorders of the vertebral column may also arise.

During exercise, movements of the heart muscles become more rapid. Breathing, too, becomes faster, ensuring a sufficient supply of oxygen and nutrients to various parts of the body.

Do you know ?

The study of muscles is called myology. Contraction is the basic property of muscles. The largest muscle of our body is in the thigh. The smallest muscle is attached to a bone in the ear, called the stapes.

Digestive system

Let's recall.

1. What happens to the food we eat, inside our body?
2. Does this food mix as it is with the blood?

Conversion of food into a soluble form and its absorption into the blood is called digestion.

The digestive system consists of the alimentary canal and digestive glands. The total length of alimentary canal is about 9 metres. Its main parts are the mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus. The salivary glands, liver and pancreas are the digestive glands connected to the alimentary canal.

Different organs of the digestive system systematically perform the function of digestion. There are different stages in the process of digestion of food and at each stage there is a different organ of the digestive system which performs its specific role. Let us study the structure and function of each organ of the digestive system.

Teeth

The process of digestion begins with the function of the teeth in the mouth. There are four types of teeth, namely, incisors, canines, pre-molars and molars. Each type of tooth has a specific function. Each tooth is covered by a hard substance called enamel. Enamel is made of a calcium salt.

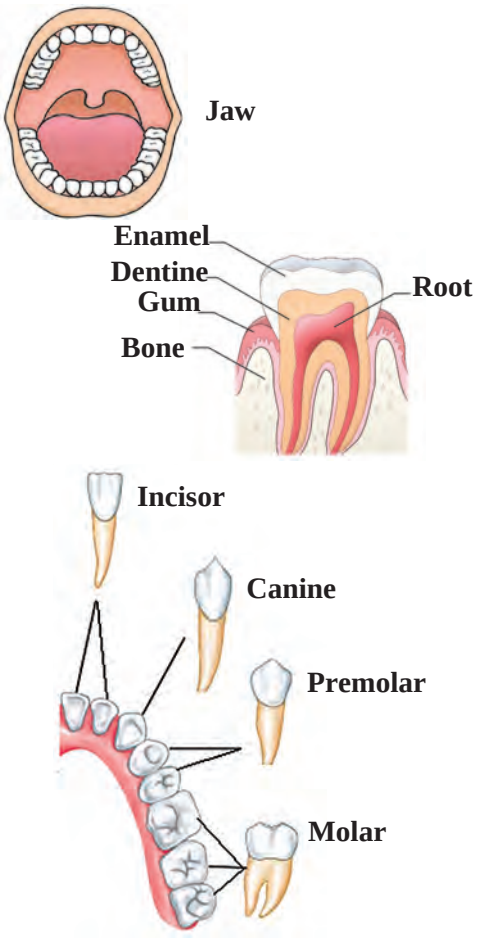
Saliva contains an enzyme called ptyalin or salivary amylase. Ptyalin converts starch into a sugar called maltose.

Use your brain power!

During digestion, does all the food that we have eaten get converted into useful, nutritive substances?

My friend, the internet!

Collect information about the various organ-systems from the websites www.livescience.com and www.innerbody.com



12.4 Teeth

Learn a new word

Enzymes are substances secreted in the body of an organism, which bring about specific chemical reactions. They act as catalysts. Digestive enzymes of the digestive system bring about changes in the food materials. Metabolic processes are impossible without enzymes. Enzymes are a specific type of proteins. They are most active at normal body temperature.

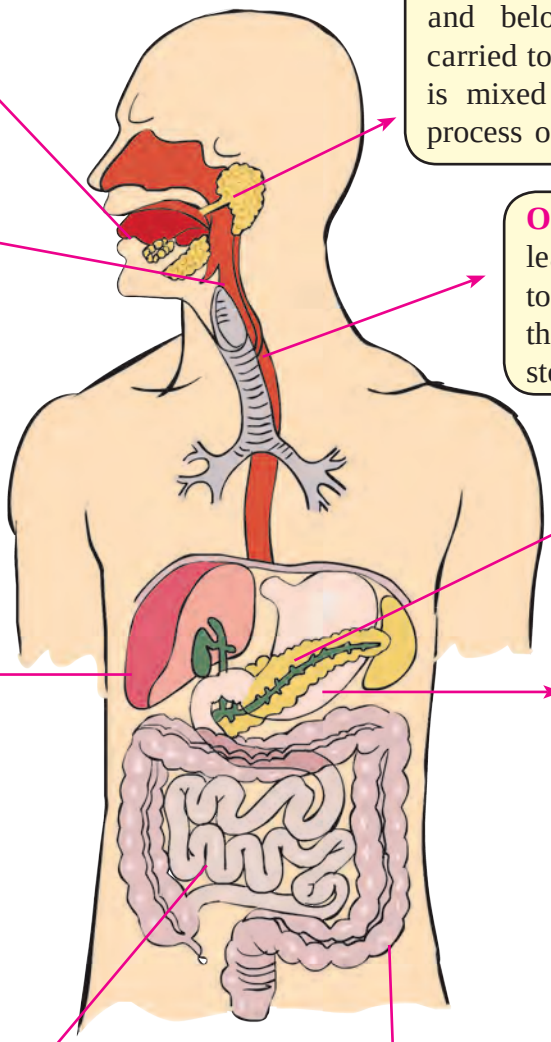
Mouth : Digestion of food begins in the mouth. Food is chewed with the help of teeth into very small pieces.

Salivary glands : Saliva is produced in the salivary glands in the mouth cavity, located in front of the ears, near the pharynx and below the tongue. It is carried to the mouth via ducts. It is mixed with food during the process of chewing.

Pharynx/Throat : The oesophagus and trachaea open into the pharynx.

Oesophagus : It is a tube leading from the pharynx to the stomach. It pushes the food towards the stomach.

Liver : The liver is the largest gland in the body. It has a rich supply of blood. Its main function is storage of glucose. The gall bladder is situated below the liver. It stores the bile, the digestive juice secreted by the liver. When bile is carried into the small intestine, it mixes with the food there and helps in the digestion of fats. Bile contains bile salts.



Pancreas : The pancreas secretes the pancreatic juice that contains various enzymes.

Stomach : The large sac-like part of the alimentary canal is called the stomach. The gastric glands of stomach secrete gastric juice. Food that has entered stomach is churned. Three components of gastric juice, namely, hydrochloric acid, pepsin and mucus are mixed with food here and it becomes acidic. Mainly proteins are digested in the stomach. Due to the churning and the action of gastric juice, food becomes a semi-solid slurry which is slowly pushed into the small intestine.

12.5 Digestive system

Small intestine : The small intestine is about 6m long. Most of the digestion and absorption of food takes place here. Three different digestive juices are mixed with the food in the small intestine. Absorption into the blood, of nutrients obtained by the digestion of food, also occurs in the small intestine.

Large intestine : The large intestine is about 1.5m long. Only water is absorbed in the large intestine. A small part called the 'appendix' is attached to the first part of large intestine. Undigested remains of the food digested in the small intestine enter the large intestine. Undigested material is thrown out of the body through the anus.

Important Glands of the Digestive System, their Secretions and Functions

Organ	Gland	Secretion	Functions
Mouth	Salivary gland	**Saliva :** Ptyalin	Conversion of starch into maltose.
Stomach	Gastric wall	**Gastric juice** Hydrochloric Acid Pepsin Mucous	 To make the food acidic. Breakdown of proteins. To protect the inner lining of the stomach from hydrochloric acid.
	Liver	**Bile**	To make food alkaline. To convert large fat particles into small ones (emulsification of fats).
	Pancreas	**Pancreatic juice** Trypsin Lipase Amylase	 To convert proteins into amino acids. To convert fats into fatty acids and glycerol. To convert complex carbohydrates into simple sugars.
Small intestine		**Intestinal juice**	To convert proteins into amino acids. To convert complex carbohydrates into glucose. To convert fats into fatty acids and glycerol.

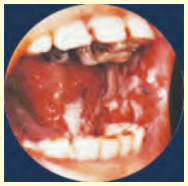
Are we putting our health at risk?

Physical health is extremely important in personality development. When all our organ systems function properly, we say that we are in good health. However, harmful habits like smoking, chewing of tobacco, drinking alcohol affect our health adversely.

Effects of tobacco, alcohol, smoking, on the digestive system

If we consume any tobacco products, the mouth, pharynx, alimentary canal and other organs of the digestive system cannot function properly. It causes problems like vomiting, nausea, and headache. Besides, tobacco particles stick to teeth, gums and skin of the mouth cavity and slowly cause injury to those parts resulting in their dysfunction. This causes swelling of the gums and pain when moving the jaws. The pharynx and intestine become inflamed and the condition further progresses into cancer leading to death.

My Role



- Making pictures and slogans against tobacco consumption, smoking, drinking alcohol, etc. and displaying them in the classroom and the neighbourhood. Keeping a watch on whether one's surroundings are tobacco-free.
- Composing an oath against addiction and taking the oath in the class and also during assembly.
- Making parents and teachers aware of such instances in the neighbourhood.

31st May is World No Tobacco Day and
7th April is World Health Day.

1. Fill in the blanks with the right word from the brackets.

(a) The process of digestion starts from the ..... . (stomach / mouth)

(b) Eyelids have ..... muscles (voluntary / involuntary) .

(c) ..... is not a function of the muscular system. (Production of blood cells / Performing movements)

(d) Muscles of the heart are ..... (ordinary muscles / cardiac muscles)

(e) Pushing forward the food that has been chewed is the function of the ..... . (stomach / oesophagus).

2. Find a match for me.

Group 'A'	Group 'B'
(1) Cardiac muscles	(a) always function in pairs.
(2) Are brought about by muscles	(b) we never feel tired.
(3) Pepsin	(c) uncontrolled and painful contraction of muscles.
(4) Cramps	(d) chewing movements of jaws.
(5) Skeletal muscles	(e) enzyme of the gastric juice.

3. Who is telling a lie?

Organ	Statement
1. Tongue	My taste-buds can tell only a sweet taste.
2. Liver	I am the largest gland in the body.
3. Large intestine	I am 7.5 meter long.
4. Appendix	Digestion is impossible without me.
5. Lung	I play an important role in excretion.

4. Give reasons.

(1) Food becomes acidic in the stomach.

(2) Cardiac muscles are said to be involuntary muscles.

(3) Intoxicating substances should not be consumed.

(4) Your muscles should be strong and efficient.

5. Answer the following.

(a) How many types of muscles are there? Which are those types?

(b) What causes the problem of acidity? What is its effect on the body?

(c) Name the different types of teeth. What is the function of each type?

6. Sketch and label a diagram of the digestive system and describe it in your own words.

Project :

1. Make charts about maintaining good health.
2. Design a powerpoint presentation about the digestive system and present it in the class.

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