CHAPTER

1 Human Organ Systems

Animation 1.1: Human Digestive System
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Students' Learning Outcomes

After completing this chapter, the students will be able to:

- Describe various components of human digestive system.
- Describe digestion and its importance.
- Describe how digestive system helps in the digestion of various kinds of foods.
- Identify common disorders of the digestive system.
- List the factors that lead to constipation and diarrhoea and the measures that can be taken to prevent them.
- Describe the mechanism of respiration in humans.
- Differentiate between breathing and burning processes.
- Identify the common diseases of respiratory system and discuss their causes and preventive measures.

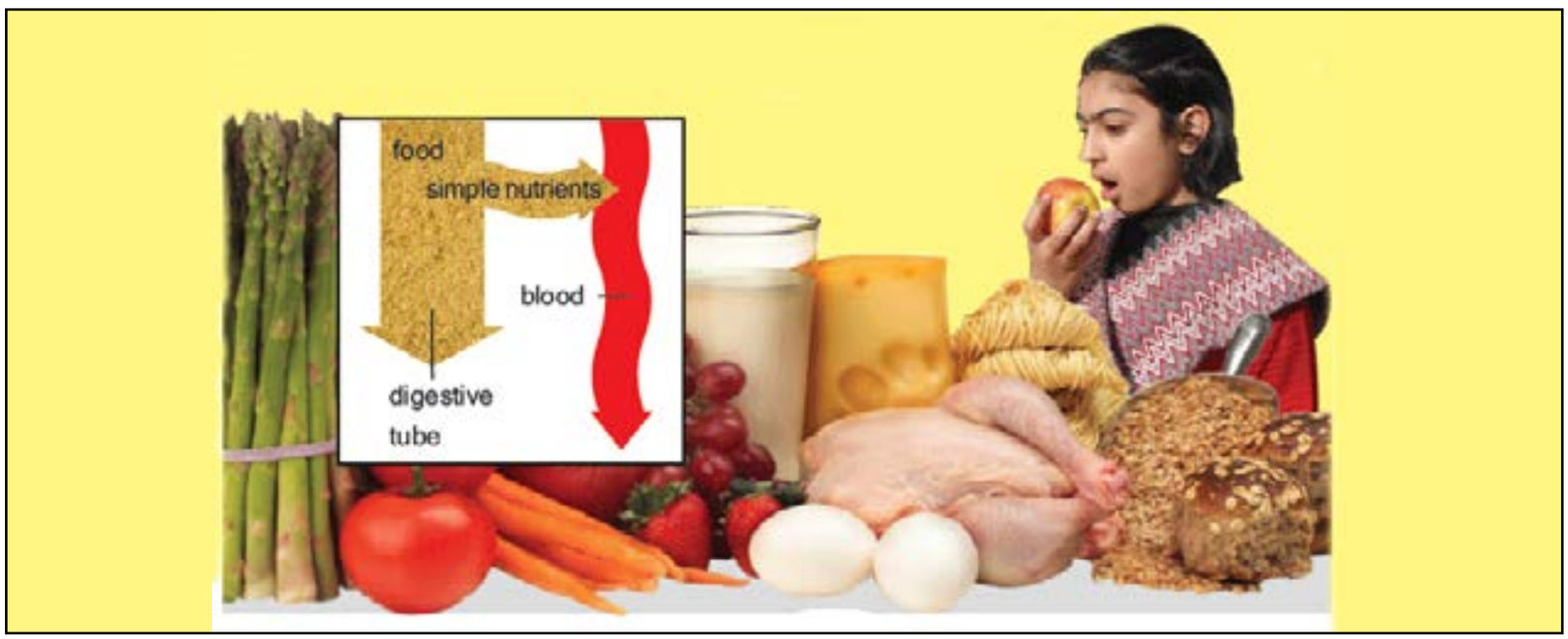
The human body is made up of trillions of cells. Cells group together to form tissues, organs and organ systems. The combined action of all the organ systems allows people to perform various activities like offering salah.

The human body is made of several organ systems that work together as one unit. In class VI we have learnt a little about the human body. In this chapter we shall learn more about the human digestive and respiratory systems.

1.1: Digestive System

Our body needs energy and food to move, grow and to stay alive. Our body cells cannot use the food in the form it is eaten by us. Our body changes it into simpler form. The process of changing the food into simpler form is called **digestion**. The parts of body that take part in the process of digestion form the **digestive system**.

Eating well is one of the most important things we can do to keep our body healthy. Different foods are the sources of nutrients. Nutrients are the useful parts of our food. Carbohydrates, proteins, fats, vitamins, minerals, etc. are the nutrients. Our digestive system breaks down nutrients into simple molecules. These simpler molecules can pass through the wall of digestive tube to enter the blood. The blood carries them to every cell to produce energy, or to become part of our body.



Where and How Digestion Occurs?

The process of digestion occurs in a long tube called alimentary canal. It starts from the mouth and ends at the anus (Fig.1.1).

Mouth

The process of digestion begins from our mouth. Our teeth break the food into small pieces by cutting and grinding. The tongue mixes food with **saliva** which is secreted by salivary glands. Saliva starts the digestion of carbohydrates (starch and sugar). After some time, the food in the mouth becomes soft and moist. The tongue pushes this food to the back of our mouth.

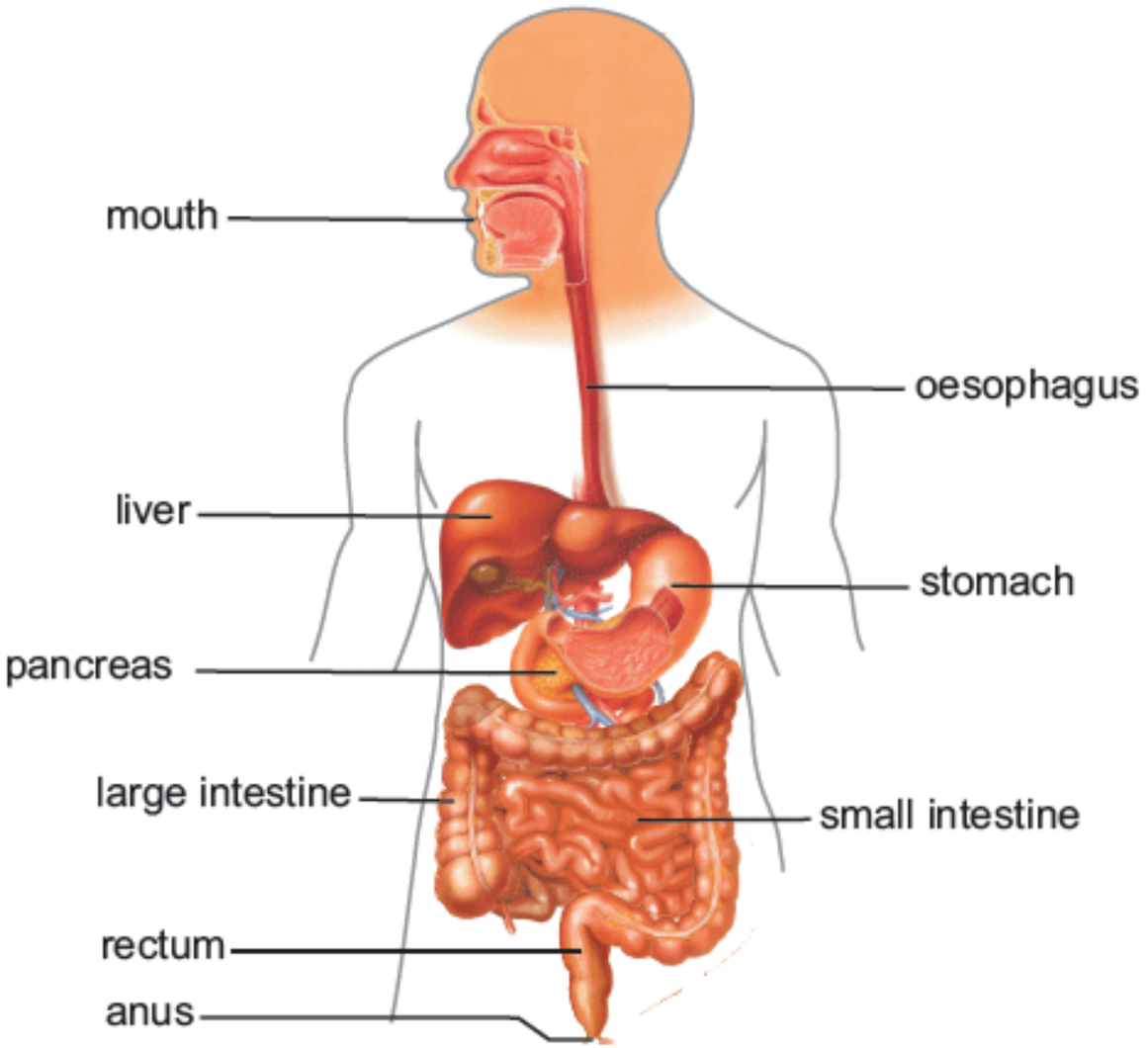


Fig: 1.1: Human Digestive System

Oesophagus

The chewed food is then pushed from the mouth into the oesophagus. The oesophagus is a large tube that carries food from the mouth to the stomach.

The oesophagus uses wave-like muscular movements to push the food to the stomach. These wave-like movements are called peristaltic movements and process is called **peristalsis**.

Extend Your Thinking

Is it possible for food we eat to go into stomach and intestine even when we are upside down? Explain it.

Our teeth are the main tools we use to break down food in the mouth. We must take care of them to make them strong. Drink plenty of milk. Use tree twig (miswak) or brush to clean our teeth. Avoid too much sweets.

Stomach

Our stomach is a large J-shaped muscular bag. It mixes the food with digestive juice. The digestive juice begins the digestion of proteins (meat, egg, milk, pulses, etc.). The food spends about four hours in the stomach.

The digestive juice in the stomach also contains an acid. The acid kills the germs present in our food. It also helps in the digestion of proteins.

Tidbit

Sometimes peristalsis works in reverse and pushes the food in stomach up and out through mouth. This reverse process of peristalsis is called vomiting. It mostly happens when the food is unsuitable in some way.

Extend Your Thinking

Our stomach digests proteins (meat, etc.). Why does its juice not digest the stomach itself?

Small Intestine

As food leaves our stomach, it is passed on to the small intestine which is a long, thin tube coiled inside our abdomen. Final digestion of carbohydrates, fats and proteins occurs in the small intestine. Three organs help in the digestion of food here. These are the liver, pancreas and wall of the small intestine. The liver provides bile salts to make fats easier to absorb. The pancreas and intestinal walls secrete juices to digest the remaining food.

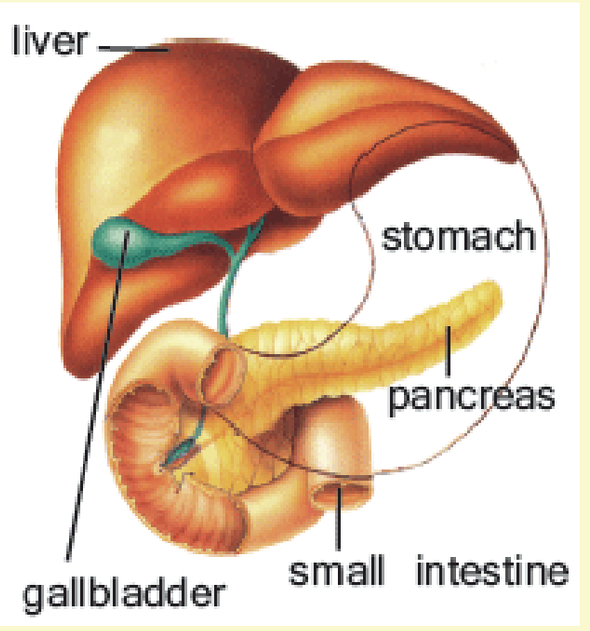
The absorption of the digested food also occurs in the last part of the small intestine. The inner surface of small intestine has many finger-like structures called **villi**. The digested food passes into the blood through the walls of the villi. The blood carries food particles to all parts of the body.

Large Intestine

The undigested part of the food passes into the large intestine. Here the undigested food has a large amount of water. The main job of large intestine is to absorb extra water. The undigested food becomes solid and is called faeces. The faeces is stored in the last part of the large intestine called the rectum. We pass the faeces out of our body through the anus.

Supporters of the Digestive System

The liver, pancreas and gallbladder are not part of the digestive tube, but they are the supporters of our digestive system. **Liver**: The liver produces bile to digest fat. It also breaks down harmful substances in the blood. **Gallbladder**: The liver stores its bile in the gallbladder which releases it into the small intestine. **Pancreas**: The pancreas makes juice to digest remaining carbohydrates, proteins and fats.



Extend Your Thinking

If we bite a bread and chew it in our mouth for some time, it will taste sweet. Why?

1.2: Disorders of Digestive System

Tidbit

Lemonade contains sugar and salt. Both sugar and salt help to absorb water in the body. So, use of lemonade is good during diarrhoea.

Some common digestive system disorders are diarrhoea, heartburn, constipation, ulcer, gas-trouble, etc. Here we shall discuss diarrhoea and constipation.

1.2.1: Diarrhoea

Diarrhoea is passing semi-liquid faeces. It may be caused by an infection, eating contaminated food, a reaction to some medicine or just anxiety or excitement.

Some of the most common symptoms of diarrhoea are: abdominal pain, cramping, bloating, nausea, loose motions, fever and bloody stools.

Diarrhoea can be fatal in case of severe dehydration. Therefore, drink plenty of liquids, otherwise dehydration may take place. Doctors prescribe antibiotics to treat diarrhoea. We can prevent diarrhoea by following the tips given below.

- Always wash your hands with soap after using the toilet.
- Wash all fruits and vegetables before cooking or eating.
- Don't eat uncooked meat and eggs.

Activity 1.1

Draw a labelled diagram of the human digestive system on a chart. Display this chart in your classroom. Identify and discuss the path of food in the body with your class fellows.

1.2.2: Constipation

Constipation is the painful or difficult passing of faeces. During the period of constipation some persons may pass faeces three or less than three times a week. It is a common digestive disorder in Pakistan.

Constipation is caused by taking food low in fibre, lack of physical activity, not drinking enough water, delay in going to the washroom, etc. We can avoid constipation by:

- Adopting a proper lifestyle.
- Taking regular exercise.
- Eating lots of fibre food (fruit, vegetables and cereals).
- Drinking plenty of water (at least 8 glasses everyday).
- Going to the washroom when we have the urge.

Fibre Keeps Our Digestive System Healthy

Dietary fibre holds water in it and softens the faeces in the large intestine, so that it can pass out of the body easily. We can keep our digestive system healthy by eating food with plenty of fibre. Dietary fibre is found in cereals (wheat, corn, barley, oat, etc.), fruits (pears, guavas, grapes, oranges, apples, etc.) and vegetables (spinach, mustard, cucumber, etc.).

1.3: Respiratory System

All living things need energy to move and grow. They get energy by breaking down food substances. We need oxygen to break down the food in every cell of our body. Our lungs take oxygen from the air during respiration (breathing).

Breathing is the process that moves air in and out of the lungs. **Respiration** is the process by which living organisms use oxygen of air and food to produce energy. Carbon dioxide is also produced during this process. The parts of body used in the process of breathing form the **respiratory system**.

Parts of Respiratory System

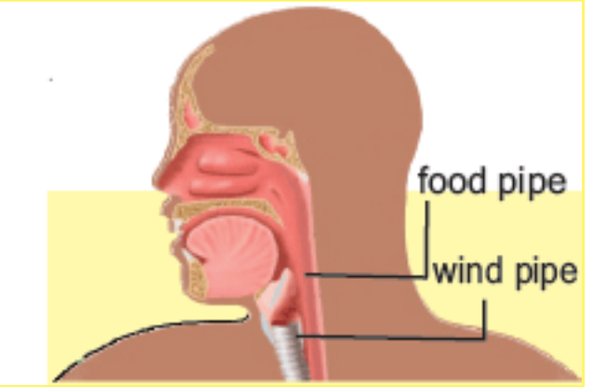
Our respiratory system consists of the nose and throat, the wind pipe (trachea), the breathing muscles and the lungs (Fig.1.2).

Nose and Throat

The air enters through our nose or mouth. Our nose has hair and mucous to clean, moisten and warm the air. Mucous is a sticky liquid. Dust particles and germs present in the air stick to the mucous.

The air enters the throat and passes through the larynx. Our vocal cords are present in the larynx to produce sound.

Our throat contains two pipes — one for the food and the other for breathing. It is the epiglottis which allows things to go down the right way. When we eat or drink something, the epiglottis covers the windpipe.



Trachea (Windpipe)

Air passes from the larynx into the trachea or windpipe. Our windpipe is made of C-shaped rings of cartilage. These rings keep our windpipe open. Mucous and tiny hair in the trachea also filter the air.

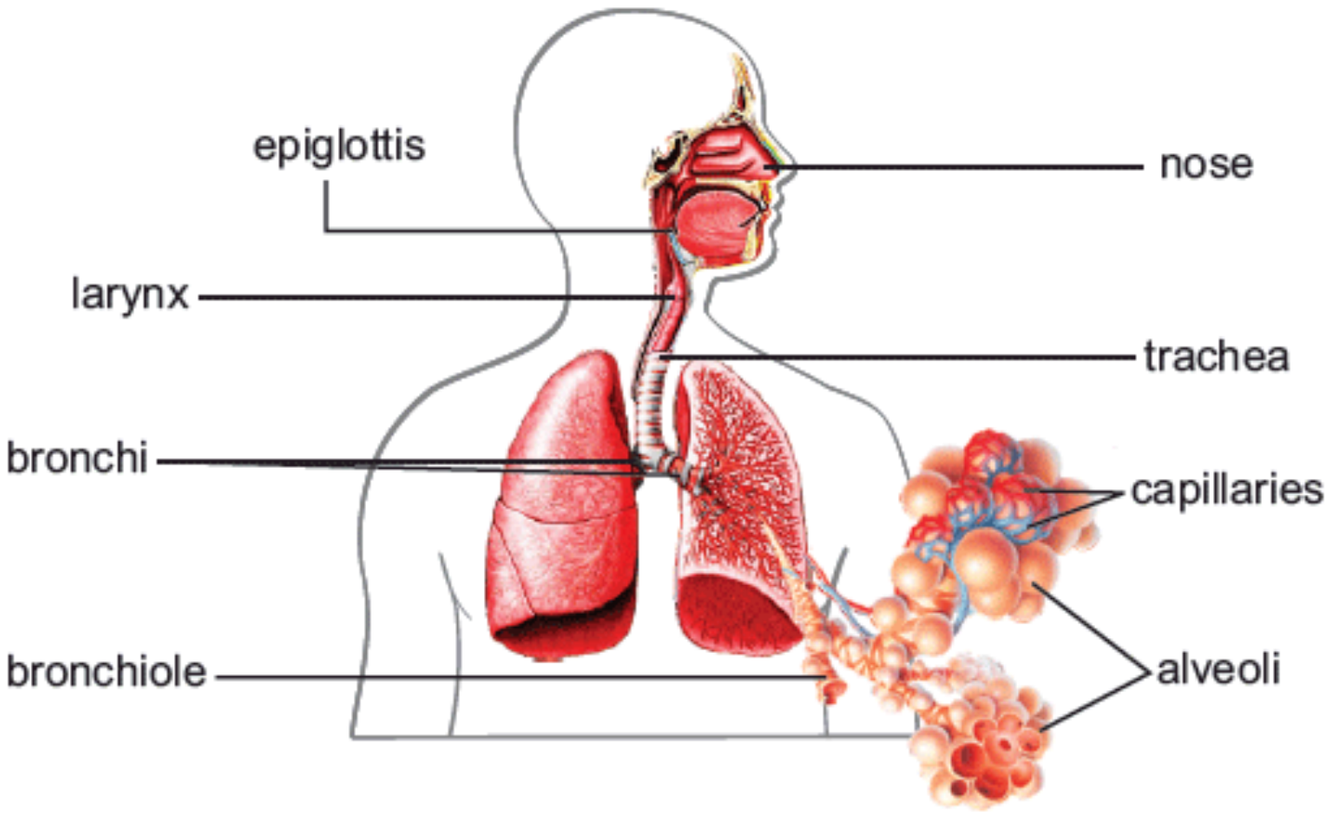


Fig 1.2: Human Respiratory System

Bronchi and Lungs

The trachea divides into two branches called bronchi (singular bronchus). Bronchi carry air into the lungs.

Our lungs are the most important organs of the respiratory system. In each lung the bronchus divides into smaller tubes called **bronchioles**. At the end of each bronchiole, tiny air sacs called **alveoli** are present. Alveoli are surrounded by blood capillaries. When we breathe in, the air enters the lungs and reaches the alveoli. Oxygen of the air passes through the walls of alveoli into the capillaries. The red blood cells carry this oxygen to every cell of our body. Cells in our body use oxygen and food to produce energy and carbon dioxide. The blood brings carbon dioxide back to the lungs. Carbon dioxide leaves our body when we breathe out.

Extend Your Thinking

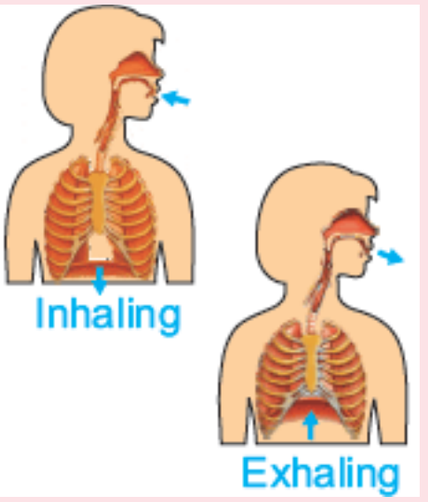
Why are we advised to breathe deeply after running a race?

How do we breathe?

Our lungs have no muscles. Two types of muscles work during the breathing process ; the intercostal muscles of ribs, and the dome-shaped diaphragm. The process of breathing is completed in two steps:

Inhaling: When the intercostal muscles pull our ribs outward and the diaphragm contracts, the air enters the lungs. It is called inhaling.

Exhaling: When the intercostal muscles and diaphragm muscles relax, the air moves out of the lungs. It is called exhaling.



1.3.1: Comparing Breathing and Burning

Breathing and burning processes can be compared.

- During both processes energy is released from a fuel.
- Both processes use oxygen and release carbon dioxide.

The main difference between the two processes is the rate at which they release energy. During breathing, release of energy is very slow than burning and its rate can be controlled.

Activity 1.2

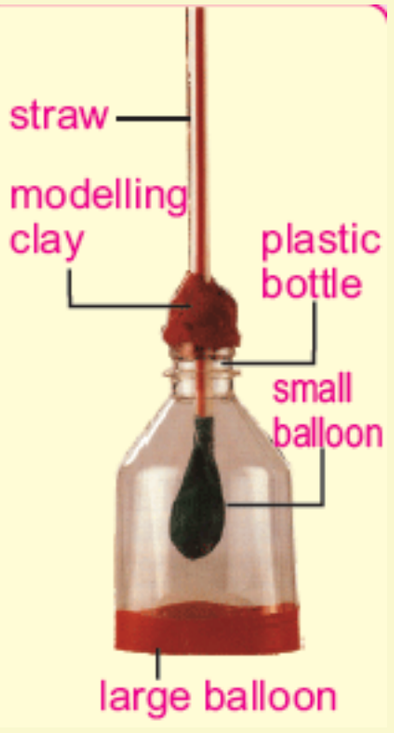
You will need

- 2 balloons (1 small, 1 large)
- Drinking straw
- Tape
- A pair of scissors
- Modelling clay or wax
- Small clear plastic bottle with bottom cut off

Procedure

1. Pull the opening of a small balloon over one end of a drinking straw. Use tape to attach the balloon to the straw.
2. Cut the neck of a large balloon. Ask your friend to hold a plastic bottle whose bottom has been cut off. Stretch the balloon over the cut end of the bottle (use tape).
3. Push the end of the straw with the small balloon into the mouth of the bottle. Then use modelling clay to seal the mouth of the bottle and to hold the straw in place.
4. Pull down the large balloon and observe what happens to the small balloon.
5. Now push the large balloon and observe its effect on the small balloon.

Working Model of a Lung



Things to think

Can you explain the movement of your lungs with the help of this activity?

1.4: Common Diseases of Respiratory System

Some common disorders of respiratory system are; common cold, influenza, pneumonia, tuberculosis and lung cancer. Here we shall discuss common cold and pneumonia.

1.4.1: Common Cold

The common cold is a common disorder of respiratory system. The virus of common cold can spread from person to person by coughing, sneezing or touching things of a common cold patient.
Symptoms of common cold are sore throat, cough, running nose, congestion, sneezing, headache, etc. We may have fever during the common cold.

There is no proper medicine for the common cold. However, you may observe the following measures. Get lots of rest, drink plenty of liquids and if symptoms persist, consult your doctor.

Extend Your Thinking

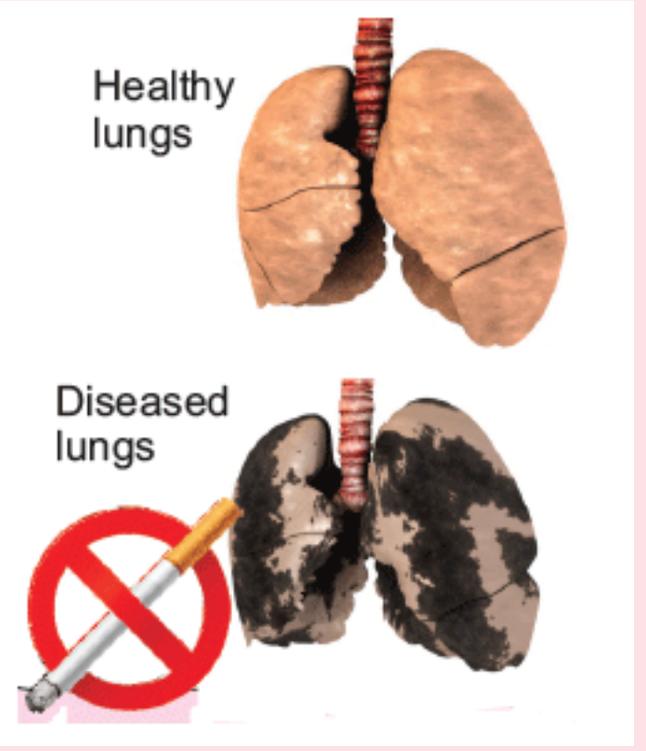
Why does our voice become rough when we get infection in throat or catch cold?

1.4.2: Pneumonia

Pneumonia is an infection that affects the lungs. The lungs are made of small sacs called alveoli, which are filled with air. When a person has pneumonia, the alveoli are filled with pus, which makes breathing painful.
Pneumonia is the main cause of death in children worldwide. Common symptoms of pneumonia are cough, fever, nasal congestion, rapid breathing with wheezing sound, chest pain, loss of appetite, etc.
Visit your doctor as soon as possible to treat pneumonia. Your doctor may prescribe an antibiotic medicine. Vaccines can also be used to prevent pneumonia. Wash your hands frequently to avoid germs. Use a tissue or handkerchief when you cough or sneeze.

Keep your lungs Healthy

1. Fruit and vegetables contain vitamins. Vitamins keep our lungs healthy.
2. Exercises like running, walking, swimming, jumping, cycling, etc. are good for our lungs.
3. Avoid smoking. Smoking is the main cause of lung cancer.
4. Leafy green vegetables contain such chemicals that are good for our lungs.



Science, Technology and Society

Adulteration of food affects our digestive system badly. Pollution especially air pollution, affects our respiratory system. Why do we think government should take action against adulteration and pollution?

Key Points

- Mouth, oesophagus, stomach, small and large intestines, liver and pancreas are the components of human digestive system.
- Digestion is a process of changing the food into simpler form. This process helps our body to get important nutrients.
- Some parts of our digestive system secrete chemicals which change carbohydrates (in mouth), proteins (in stomach) and fats into simpler substances. These substances are then absorbed into blood.
- Diarrhoea, heartburn, constipation, ulcer, gas-trouble, etc. are some common disorders of digestive system.
- Diarrhoea may be caused by an infection, by eating contaminated food or a reaction to some medicine.
- Washing hands frequently and washing fruits and vegetables before eating or cooking can help to prevent diarrhoea.
- Constipation may be caused by taking food low in fibre, lack of physical activity, not drinking enough water, etc.
- We can prevent constipation by eating food rich in fibre, by drinking plenty of water and by taking regular exercise.
- Our respiratory system helps to produce energy which we use in our activities.
- Breathing and burning are similar processes, but release of energy is very slow during breathing.
- Common cold, influenza, pneumonia, tuberculosis, lung cancer, etc. are some common disorders of the respiratory system.
- We can keep our lungs healthy by eating fruits and vegetables, and by taking regular exercise.

Questions

1. Complete each of the following sentences by writing the correct term.

i. The process of breaking down of food _____

ii. Muscular contractions that move food _____

iii. The grape-like clusters of tiny thin-walled balloons in lungs _____

iv. The dome-shaped muscle at the bottom of our chest _____

v. The process of getting air into and out of the lungs _____

3. Give short answers.

i. How is carbon dioxide produced is in our body?

ii. How is small intestine important in our digestive system?

iii. Why are we provided with teeth?

iv. What are alveoli?

v. Briefly describe the mechanism of breathing.

vi. What measures can one take to prevent diarrhoea?

4. Explain the process of digestion of food in the mouth and the stomach.

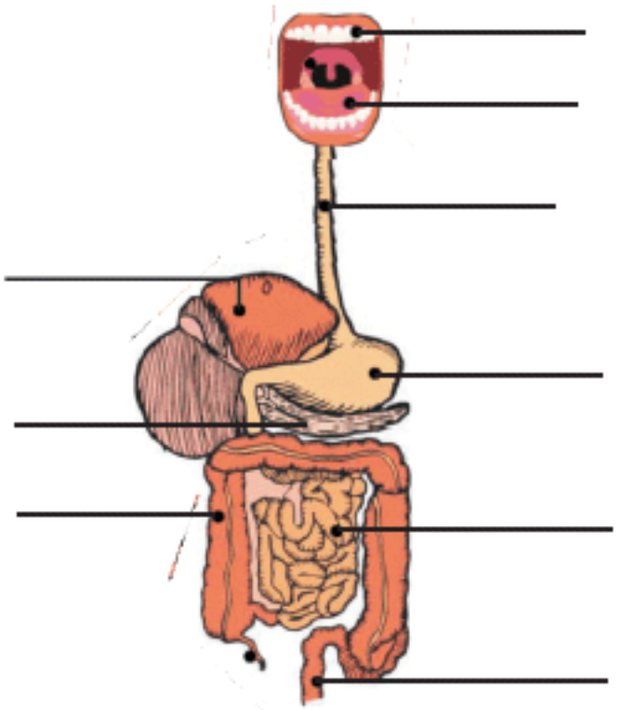
5. Describe the human respiratory system.

6. Write notes on the following:

i. Constipation

ii. Pneumonia

7. Label the diagram.



Computer Links

For more information visit:

- http://kidshealth.org/kid/htbw/lungs.html
- http://www.stcms.si.edu/hbs/hbs_student.htm