Digestion

BIOLOGY • HUMAN BODY • DIGESTION

Section 1: Why We Eat

• Why do we need to eat food?

We need to eat in order to obtain the materials that allow us to grow and repair our tissues. We also need food to provide us with the energy necessary for all cells to perform their different functions. Ideally, we should eat a healthy diet which contains the right balance of carbohydrates, proteins, fats, minerals and vitamins.

A healthy diet contains the right nutrients in the amounts the body needs

• Suggested Film

– Introduction to Digestion

• Suggested Activities

- Ask students to analyse food labels and their nutritional value

- Ask students to discuss what constitutes a healthy daily diet

Extension Questions

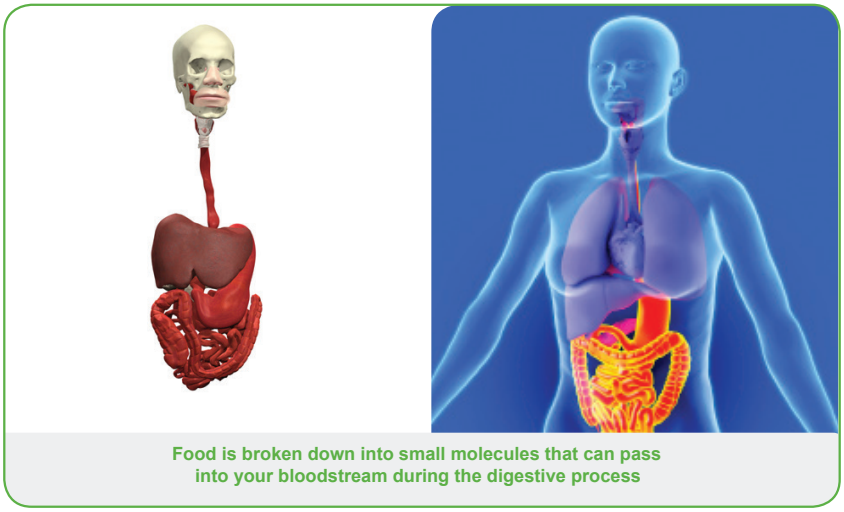
Q1. What happens if you don't get the right amount of nutrients in your diet?

If you don't get the right amount of certain nutrients you can become unwell and possibly suffer from a deficiency disease. For example, people who lack sufficient protein in their diet suffer from a condition known as kwashiorkor, and those lacking iron can become anaemic.

Q2. What is a calorie?

A calorie is a unit used to measure the amount of energy in food. Food labels often show how many calories of energy a food contains. Ideally someone should consume the same number of calories per day as they use. If they don't, they can gain or lose weight.

• Why do we need to digest our food?



Food is broken down into small molecules that can pass into your bloodstream during the digestive process

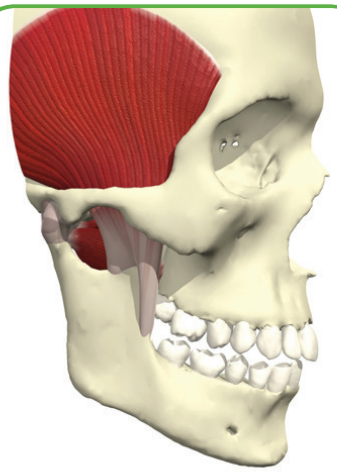
Much of the food we eat consists of large, complex molecules which are insoluble and cannot be absorbed into the bloodstream. The job of the digestive system is to break these large molecules down into simpler forms. For example, starch needs to be broken down into sugars, and proteins into amino acids.

• Suggested Film

– FactPack: Digestion

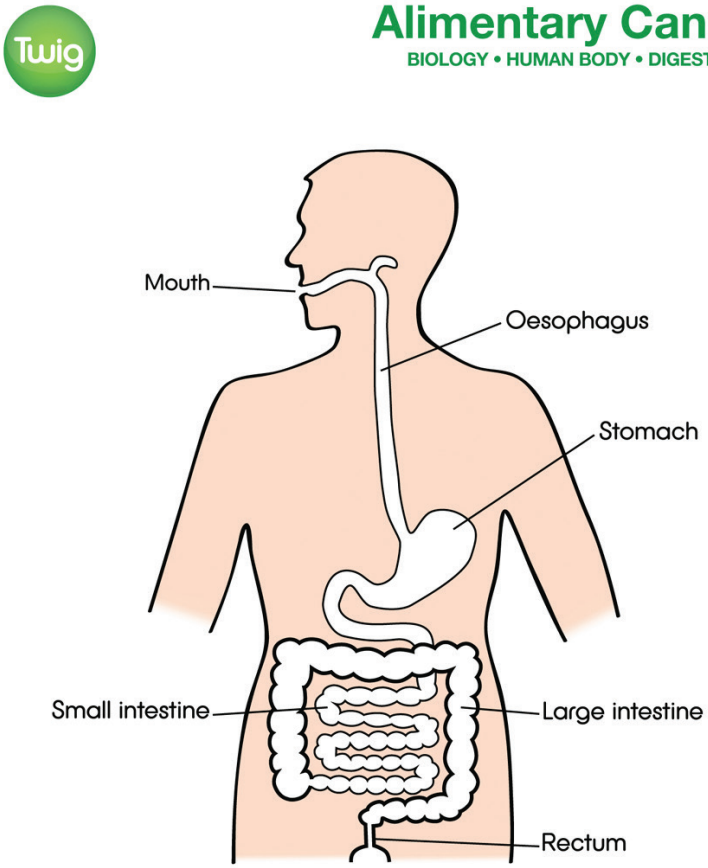
This digestive process can be performed both mechanically and chemically. For example, when you ingest food, your teeth chew the food in order to break it down into smaller pieces (mechanical digestion) and an enzyme in your saliva called amylase starts to convert starch into sugar (chemical digestion). Once this is done you swallow the food, which is pushed down the oesophagus by peristalsis to the stomach.

- **Suggested Films**
  - **Introduction to Digestion**
  - **FactPack: Teeth**



The muscles used to bite and chew

DIAGRAM 01:



Extension Question

Q3. What types of food don't need to be digested?

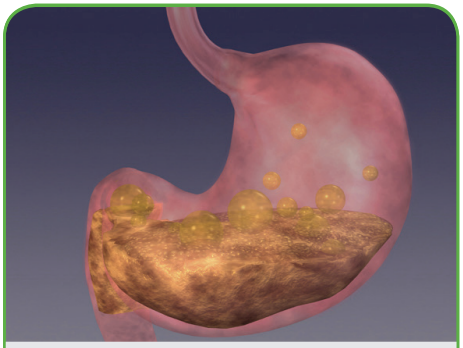
Any food substance which is already simple, small and soluble doesn't need to be digested. Instead, it can be rapidly absorbed into the blood, often through the stomach lining. Glucose and alcohol are good examples.

Section 2: How Food Is Digested

• What does the stomach do?

The stomach both stores ingested food and continues the digestive process. The stomach also contains hydrochloric acid which kills germs on the food.

Digestion is carried out mechanically by the churning of the stomach and chemically by the action of a protease enzyme, which starts to break down protein in the food into amino acids. Food often stays in the stomach for several hours before being pushed on into the small intestine.



The stomach aids digestion by breaking down food

• Suggested Films

- Stomach
- Burps and Farts

Extension Question

Q4. Why do we vomit?

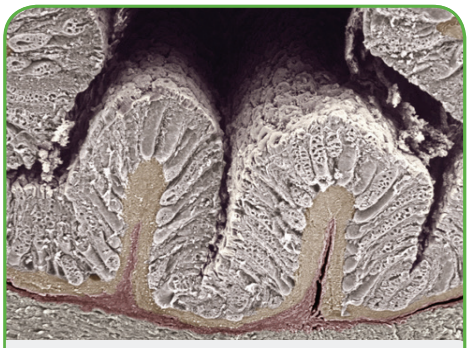
We vomit when our stomach becomes overfilled or when it is irritated. Irritation of the stomach is usually due to viral infection or bacteria on the food we have eaten (called food poisoning). Some people also vomit due to motion sickness, for example, on a boat or in the back of a car.

• What happens in the small intestine?

The small intestine is the longest part of your digestive tract

Digestion is completed and the food particles are absorbed in the small intestine. Enzymes including amylases, proteases and lipases are secreted into the small intestine by the pancreas and the intestinal wall. Bile is also added, which helps to neutralise the stomach acids and emulsify the fats. Slowly the starches are turned to sugars, the proteins to amino acids, and the fats to glycerol and fatty acids.

These products of digestion can then be absorbed through the lining of the small intestine into the bloodstream. The lining of the small intestine is covered with tiny finger-like projections called villi. These provide a massive surface area for absorption of the food particles, and are supplied with a rich blood supply to transport the materials away to the rest of the body.



Cross-section of the intestine

• Suggested Film

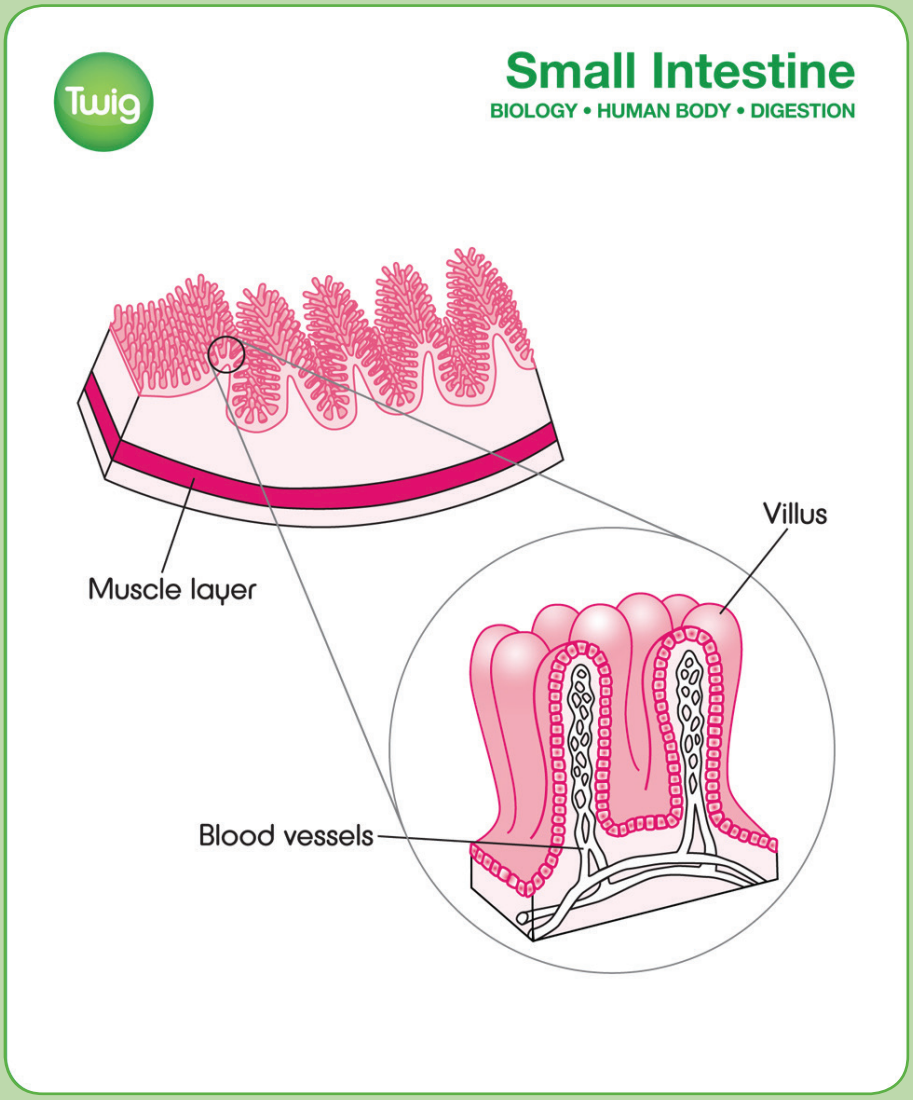
- Small Intestine
- Beef Tapeworms: Part 1
- Beef Tapeworms: Part 2

Extension Question

Q5. What is coeliac disease?

Coeliac disease is an autoimmune disorder caused by a reaction to gluten, a protein found in wheat and other similar grains. The reaction leads to an inflammation of the small intestine, which gradually causes the villi to break down. Shorter villi means less surface area, and so the symptoms of malabsorption become present, including diarrhoea, weight loss and fatigue. People with coeliac disease have to eat a gluten free diet.

DIAGRAM 02:

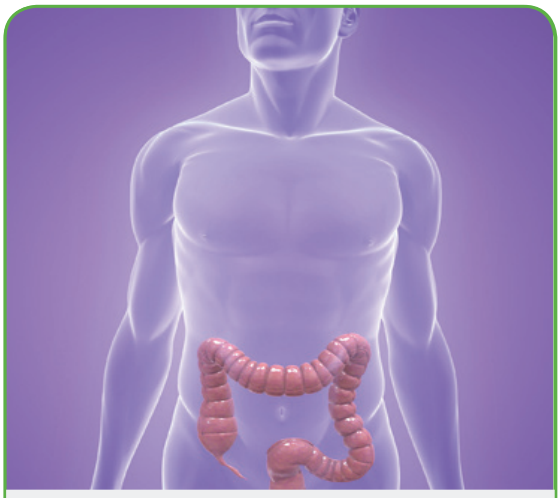


- What happens to the food that has been absorbed?

The food particles that have been absorbed into the blood are transported around the circulatory system to all the body's tissues. The cells in these tissues are now able to obtain the materials they need to respire, to make new substances such as enzymes and hormones, and to grow and divide.

Section 3: How Waste Is Removed

• What happens to the undigested food?



The large intestine is 1.5 to 2m long

Some food is difficult to digest. Much of this food passes into the large intestine where millions of bacteria feed off it. In doing so they help with its digestion, and they also create useful substances such as certain vitamins. The large intestine absorbs these vitamins as well as much of the water. What can't be absorbed, such as fibre and dead bacteria, is eventually passed out of the body as faeces. This process is called egestion or defaecation.

• Suggested Film

- Large Intestine

• Suggested Activity

- Ask students to produce a poster showing the alimentary canal

Extension Questions

Q6. What is fibre and why is it important in our diet?

Fibre refers to indigestible plant matter in our diet – mostly the cellulose that makes up the cell walls of plants. It helps to bulk up our diet, which aids the action of peristalsis and thereby prevents constipation. It also helps to stabilise blood sugar levels and is thought to lower cholesterol in the blood.

Q7. What causes diarrhoea?

Diarrhoea can be caused by a number of factors, such as inflammation of the large intestine, infection from bacteria and viruses, and also malabsorption. Insufficient water is absorbed by the large intestine and this can lead to dehydration.

X-ray showing large intestine

Q8. What are 'friendly bacteria'?

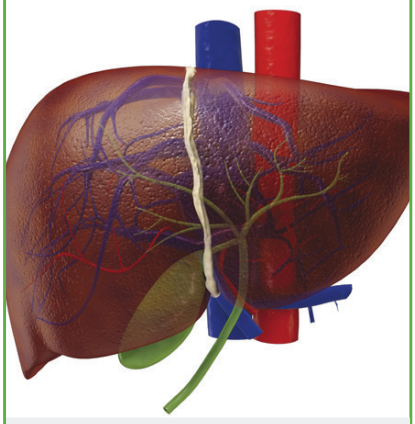
The term 'friendly bacteria' usually refers to beneficial bacteria in the gut which are important to health in a number of ways. For example, they can help digest certain foods, manufacture vitamins and prevent harmful bacteria from colonising the intestines. Some people now supplement their diet with probiotics – cultures of beneficial bacteria, such as lactobacillus.

• What role does the liver play in digestion?

The liver has a wide range of functions, many of which are related to the digestive process. The liver manufactures bile, for example, which is stored in the gallbladder, and nutrient rich blood from the gut travels directly to the liver where food particles can be stored and chemically altered. The liver also detoxifies alcohol and toxins which have been absorbed during the digestive process.

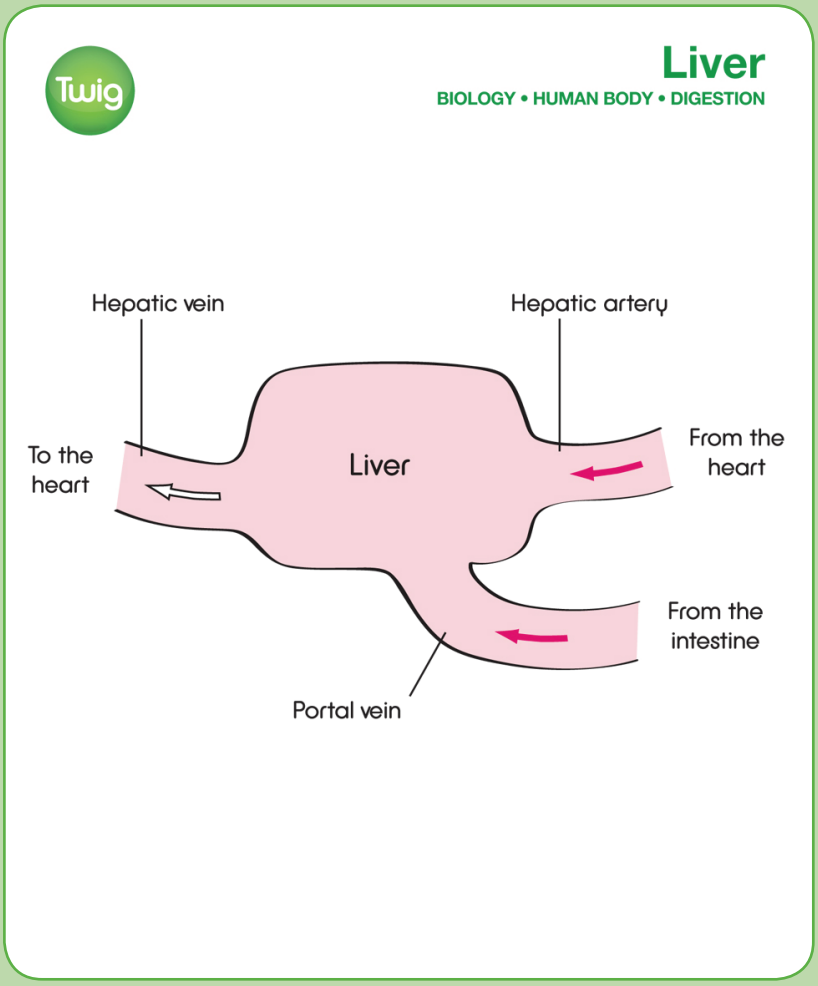
• Suggested Film

- FactPack: The Liver



The liver produces the digestive liquid bile

DIAGRAM 03:



• What do the kidneys do?

The kidneys have two essential functions. The first is to remove toxic waste products such as urea from the blood. The other is to control the water and salt content of the blood by adjusting how much water and salt are excreted in the urine. If the body is dehydrated, for example, if you haven't drunk fluids for a long time, the kidneys make sure that very little is lost from the body, so the urine produced is concentrated and low in volume. However, if you drink a lot of water, the excess can be passed out in the urine making it clear in colour.

• Suggested Film

- Kidneys

A close-up of the inside of a lamb's kidneys

• Quizzes

Digestion

Basic

• Why do we need to digest our food?

A – to taste it

B – to absorb it into the bloodstream

C – to release energy from it

D – to neutralise it

• Which of the following are all parts of the digestive system?

A – mouth, trachea, stomach

B – mouth, stomach, liver

C – stomach, oesophagus, small intestine

D – small intestine, oesophagus, liver

• What is the name of the digestive juice produced in your mouth?

A – amylase

B – bile

C – gastric juice

D – saliva

• What are your teeth used for?

A – speaking

B – chewing food

C – tasting food

D – swallowing food

Advanced

• Why do we need to digest our food?

A – to taste it

B – to absorb it into the bloodstream

C – to release energy from it

D – to neutralise it

• How do we digest our food?

A – by chewing

B – with bile

C – with enzymes

D – by chewing and with enzymes

• What is the name of the enzyme in your saliva?

A – pepsin

B – oesophagus

C – amylase

D – bile

• What is the name of the tube that carries food from your mouth to the stomach and how is food pushed along this tube?

A – oesophagus, peristalsis

B – trachea, peristalsis

C – trachea, circulation

D – oesophagus, circulation

• Answers

Digestion

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