2020
Version

Food and Digestion

Junior Science

GZ Science Resources

The food we eat is divided into four main groups

Carbohydrates
- ❑ Supply instant energy
- ❑ Include sugar and starches
- ❑ Are supplied by fruit (sugar) or cereals and some vegetables (Starch)

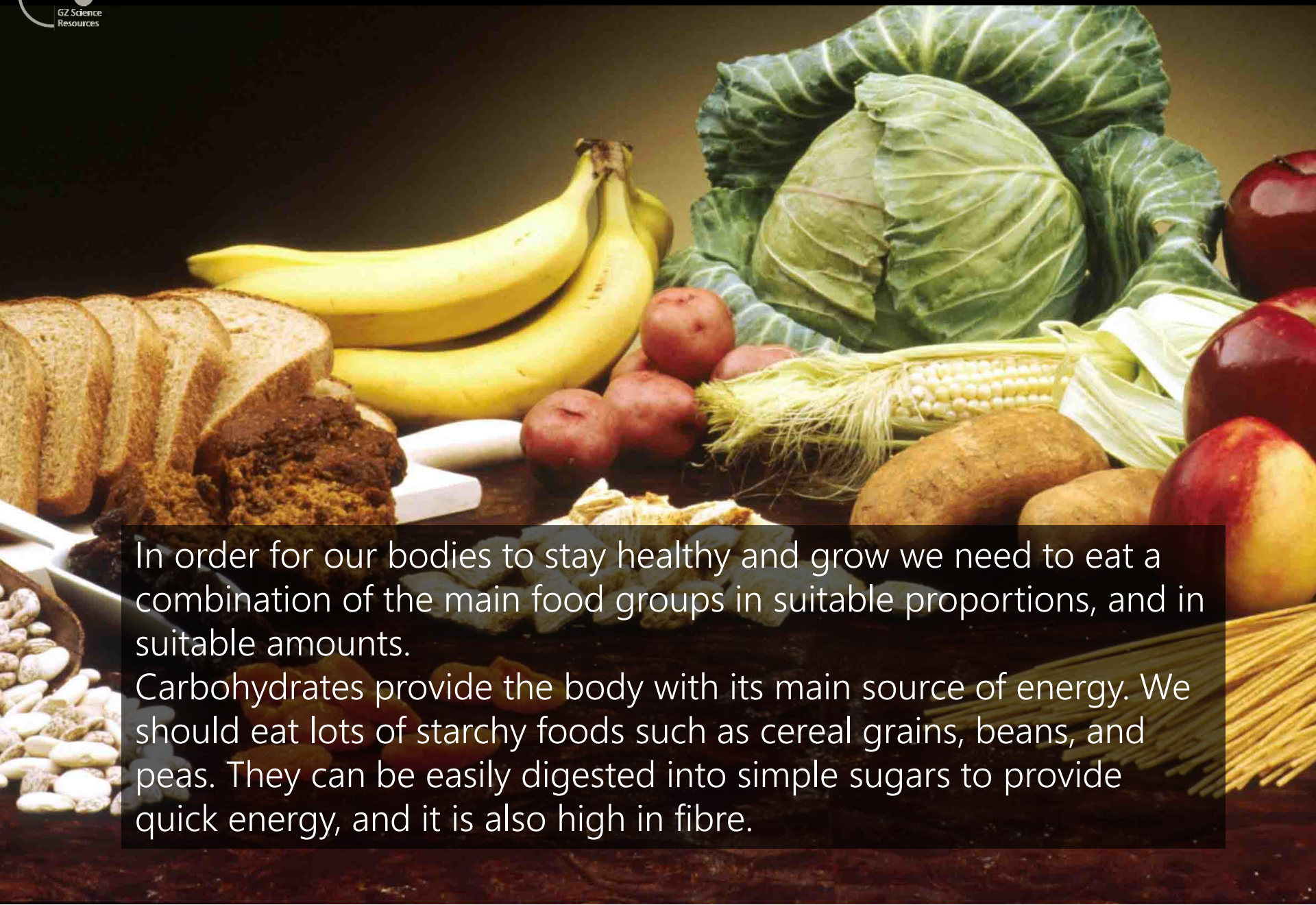
Lipids
- ❑ Act as energy stores
- ❑ Include fats and oils
- ❑ Are energy rich
- ❑ Are made of fatty acids

Proteins
- ❑ Are used for growth and repair
- ❑ Are found in meat and eggs
- ❑ Are made of amino acid chains
- ❑ Are an important source of iron

Minerals and vitamins
- ❑ Body needs them in small amounts
- ❑ Found in many foods
- ❑ Non-organic substances
- ❑ Needed for important body processes

Humans and most other animals need to eat a combination of all of the food types. Some foods contain more than one food type – for example dairy foods have a good supply of lipids, proteins and sugars, as well as essential vitamins like calcium.
Fish contain lipids, protein and an important supply of vitamins

Healthy diet - Carbohydrates



In order for our bodies to stay healthy and grow we need to eat a combination of the main food groups in suitable proportions, and in suitable amounts.

Carbohydrates provide the body with its main source of energy. We should eat lots of starchy foods such as cereal grains, beans, and peas. They can be easily digested into simple sugars to provide quick energy, and it is also high in fibre.

Healthy diet - Fats

Fats are also are important in our diet as they provide us with energy and protect our vital organs from shock. But fats can be stored in the body when you eat more than your body requires. It stores them in special tissues. A proper diet and exercise will make sure that you have enough fat so your body functions properly, but not more than you need.

Healthy diet - Proteins

We also need Proteins found in foods such as meat, fish, and eggs, so our bodies can grow and repair themselves. Most meats have lots of protein but it can also be found in plants, eggs and dairy foods.
By having a healthy diet you will also eat all of the minerals and vitamins that a person needs.

Proportions of food groups in a healthy diet

Aim for half of your food to be in the form of vegetables and fruit. These contain a healthy proportion of carbohydrates, proteins and fats as well as providing a good source of important vitamins and minerals.

A smaller and equal portion of both carbohydrates and proteins can be added to this along with a small but important serving of healthy fats.

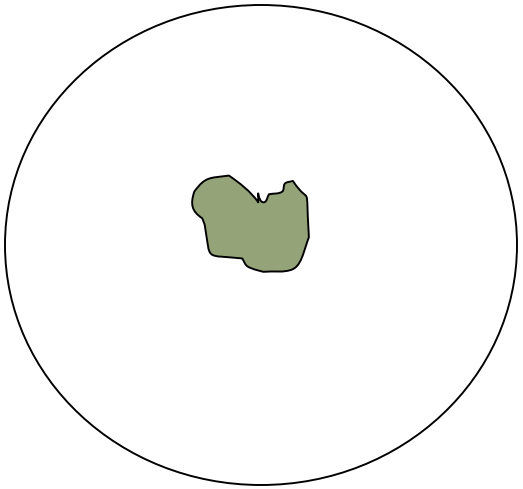
A portion of dairy food (milk, yogurt and cheese) provides protein, carbohydrates and fats.

http://theblueroom.bupa.com.au/healthier/healthy-eating

We use tests to determine which type of food is present.

Lipids – present in fats and oils

Some of the food rubbed into filter paper. Remove food and allow to dry



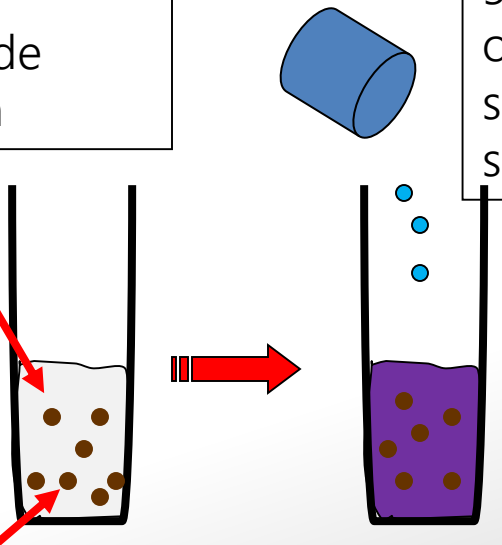
A 'grease spot' that is slightly transparent is left where the food was rubbed in **if lipid was present**

Protein – present in meat and eggs

The Biuret test

Add 5 drops of Sodium hydroxide solution

Then add 5 drops of copper sulfate solution



Broken up food particles

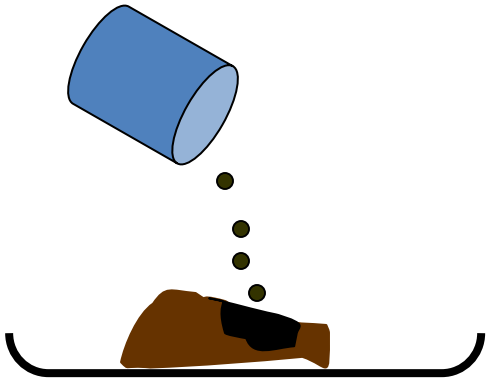
Mixture turns purple **if protein present** and remains blue if no protein present

We use tests to determine which type of food is present.

Starch – present in cereals

The Iodine Test

Place a few drops of iodine on the food



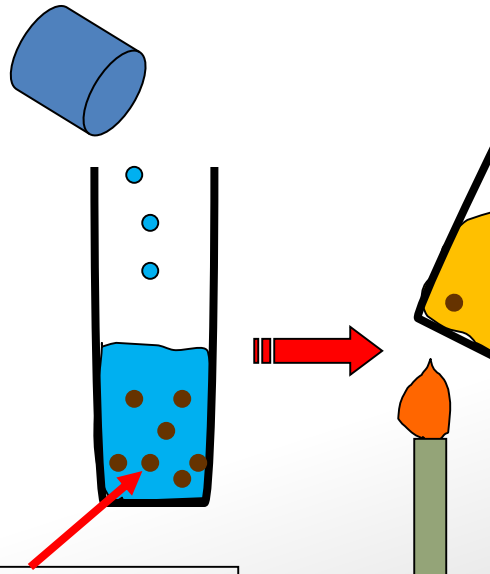
Food will turn blue/black **if starch is present.** The iodine will remain the darkish brown colour if starch is not present

Glucose – type of sugar

The Benedict's Test

Add 5 drops of Benedict's solution

Heat mixture gently



Broken up food particles in water

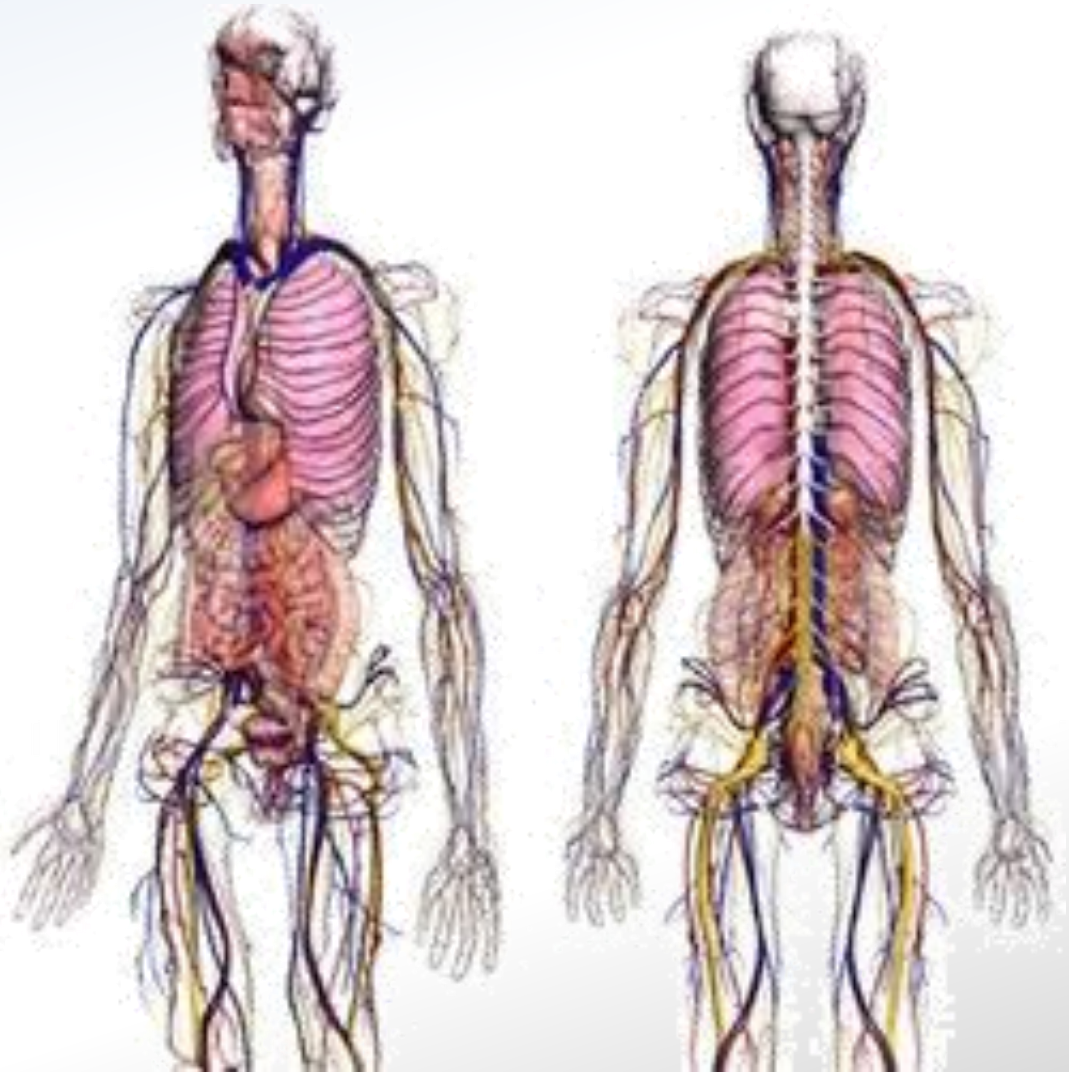
Mixture will turn from a blue colour to orange and then finally a brick red/orange colour **if glucose present**

The structure and functions of the human (as an animal) systems

All vertebrates (animals with backbones) share the same basic body plan, with tissues and organs working in a similar manner. We focus on the digestive system in the human body, by studying the structure and the function of the body.

Other main organ systems include the respiratory, circulatory, reproductive, excretory and nervous systems

The body is made up of different organ systems



Different tissues functioning together for a common purpose are called **organs** (eg, stomach, kidney, lung, heart).

Organ systems are composed of individual organs working together to accomplish a coordinated activity. For example, the stomach, liver and intestines all play a role in digestion.

Background Knowledge

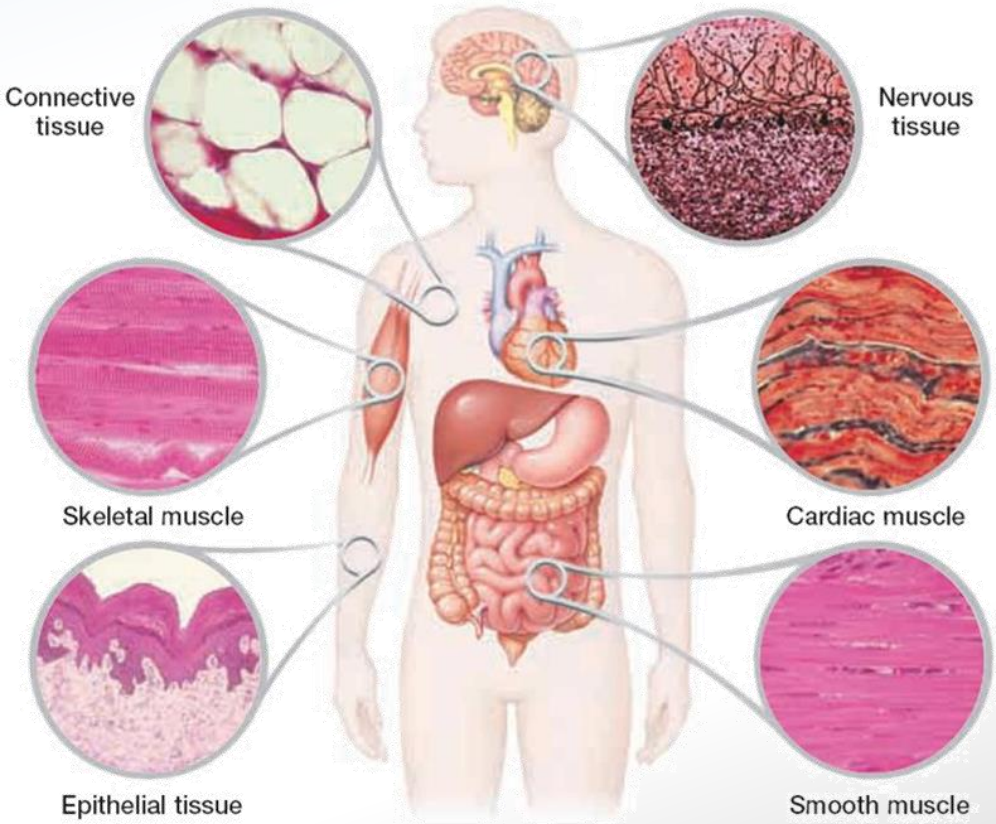
All living things share the characteristics described in MRS C GREN

The digestive system enables the human body to extract useful chemicals from the environment (Nutrition)

Life function	Gives us the ability to….
Movement	move through space
Respiraton	obtain energy through biochemical reactions in cells
Sensitivity	respond to the outside environment
Cells	Smallest unit of life – makes up the bodies of bigger organisms
Growth	increase in size
Reproduction	create more living things
Excretion	dispose of waste chemicals
Nutrition	extract useful chemicals from the environment

The body is made up of different organ systems

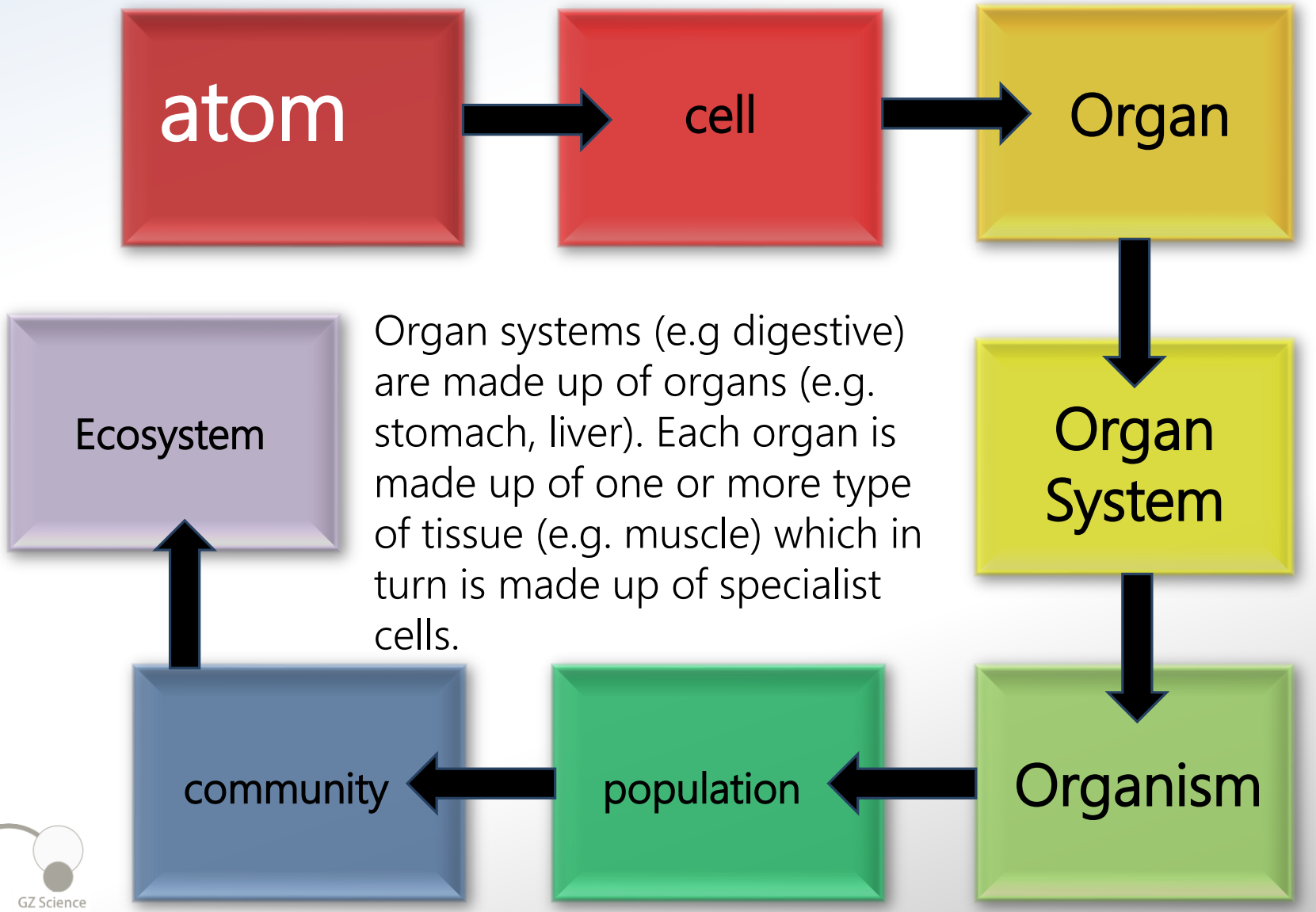
Animals are made of complex **systems of cells**, which must be able to perform all of life's processes and work in a coordinated fashion to maintain a stable internal environment.



extra info

During a human's early development, groups of cells specialise into three layers. These three layers then **differentiate** (change) into a number of specialised cells and tissues. Tissues are groups of cells similar in structure and function .

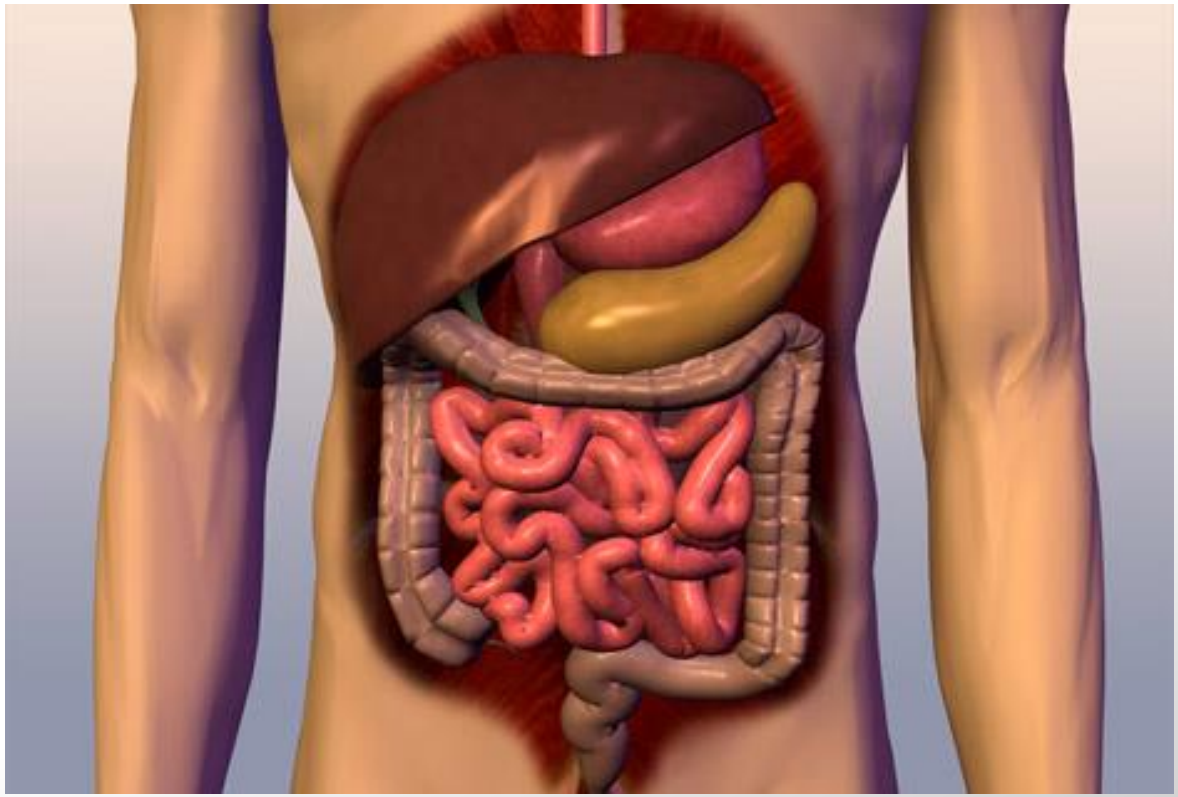
Biological material is **organised** in to levels from simplest to most complex



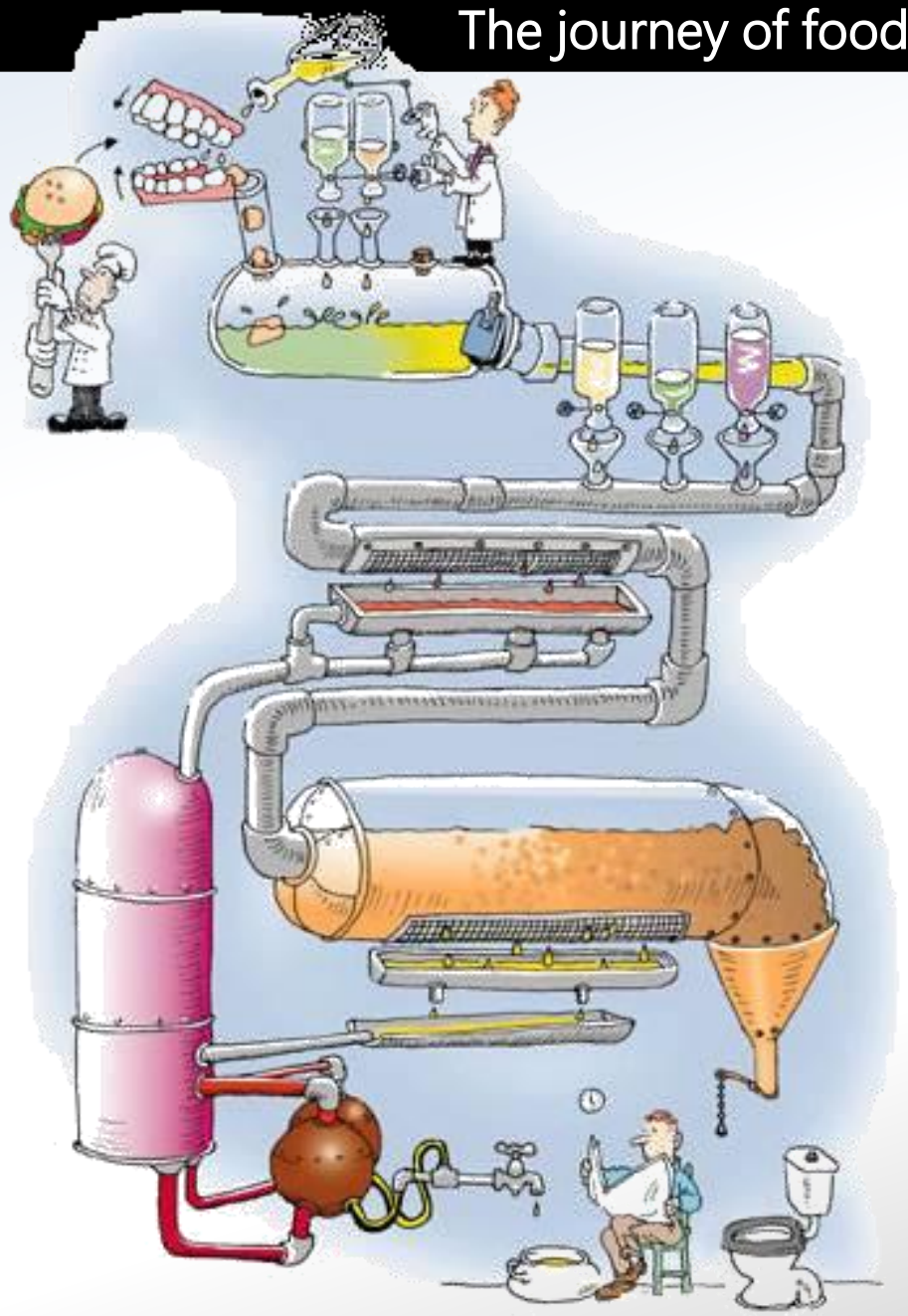
Organ systems (e.g digestive) are made up of organs (e.g. stomach, liver). Each organ is made up of one or more type of tissue (e.g. muscle) which in turn is made up of specialist cells.

The digestive system

The **digestive system** breaks down food ingested into smaller soluble molecules that can be absorbed into the circulatory system and then used by the cells of the body. It is composed of the mouth, pharynx, oesophagus, stomach, small intestine and large intestine and is aided by several accessory organs (liver, gall bladder, and pancreas).

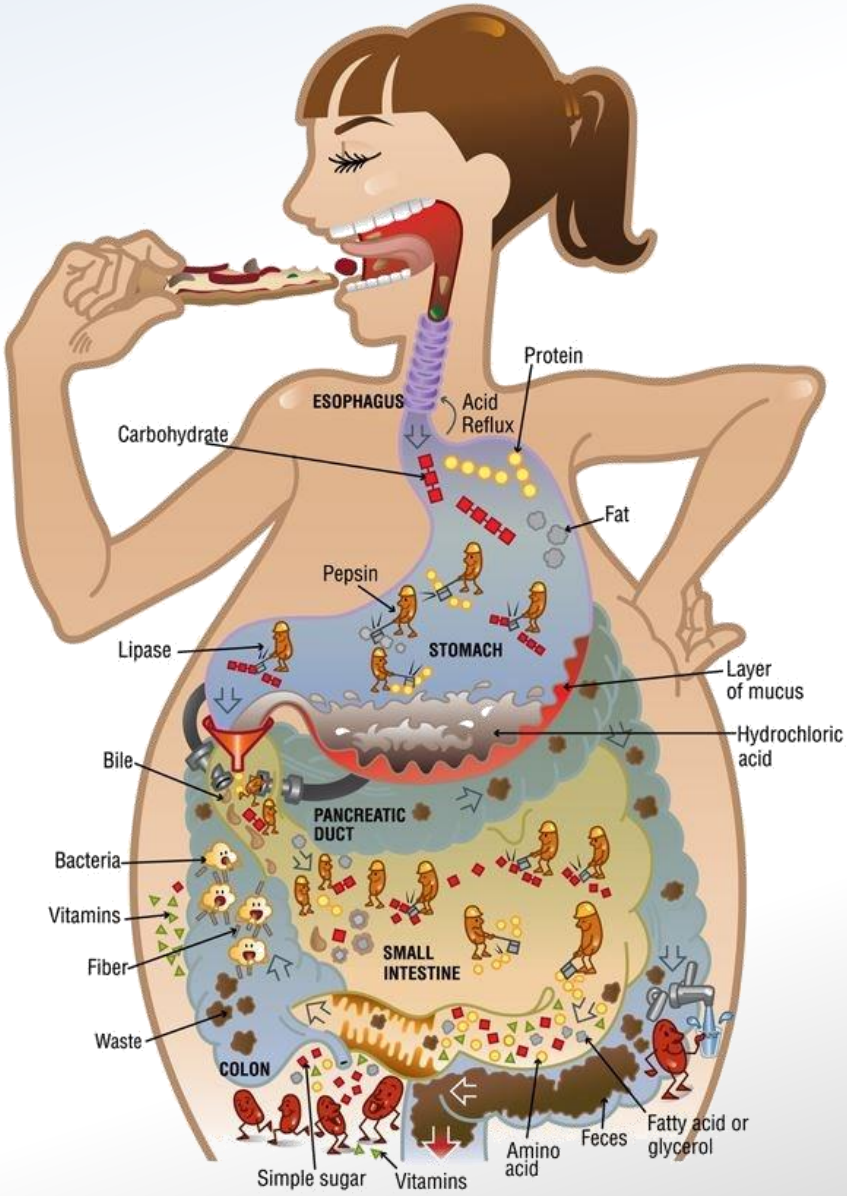


The journey of food through the body



In summary, the food enters the mouth (**ingestion**) and is broken into smaller pieces by the teeth and saliva then the stomach and various enzymes and acid (**digestion**). The small intestine is where most of the soluble molecules pass into the blood stream (**absorption**) and further down in the large intestine the water is reclaimed. The waste products from the digestive system are then passed out of the body (**egestion**)

The journey of food through the body



Various parts of the food are digested and absorbed in different parts of the digestive system.
The body produces different enzymes and substances, such as acid, which break down all the components of the food.
We also have numerous "helpful" bacteria which also help digest the food.

Digestion breaks large molecules of food into small ones, which can then pass through the wall of the gut into the blood.

Ingestion

How we take in food using our mouths

Digestion

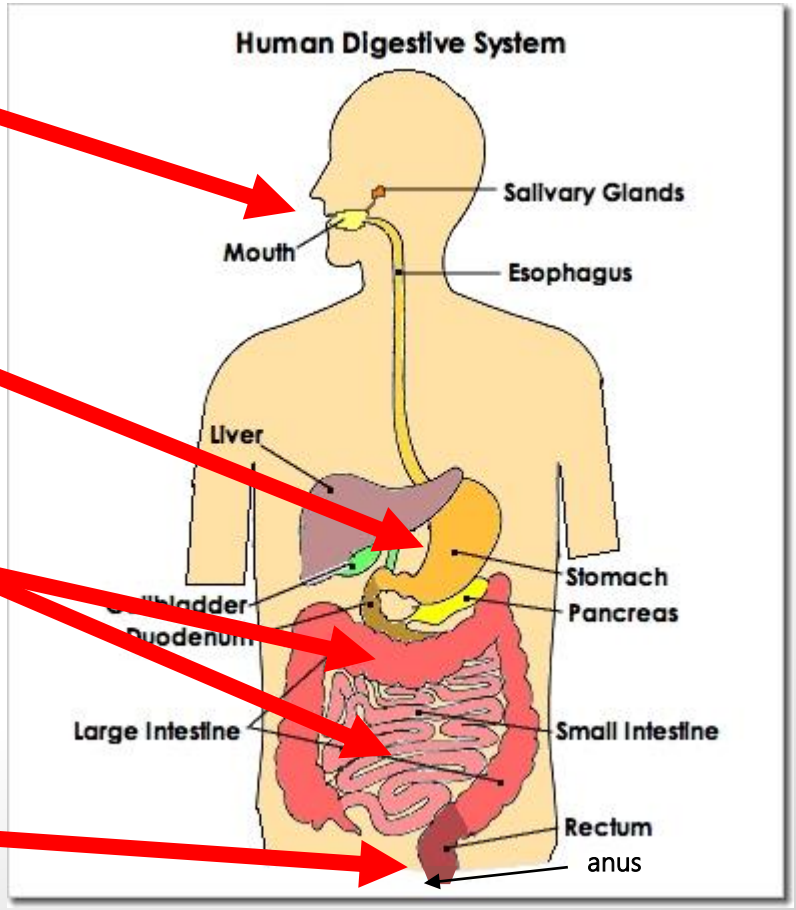
Breaking food down into soluble molecules.

Absorption

Taking food into the blood

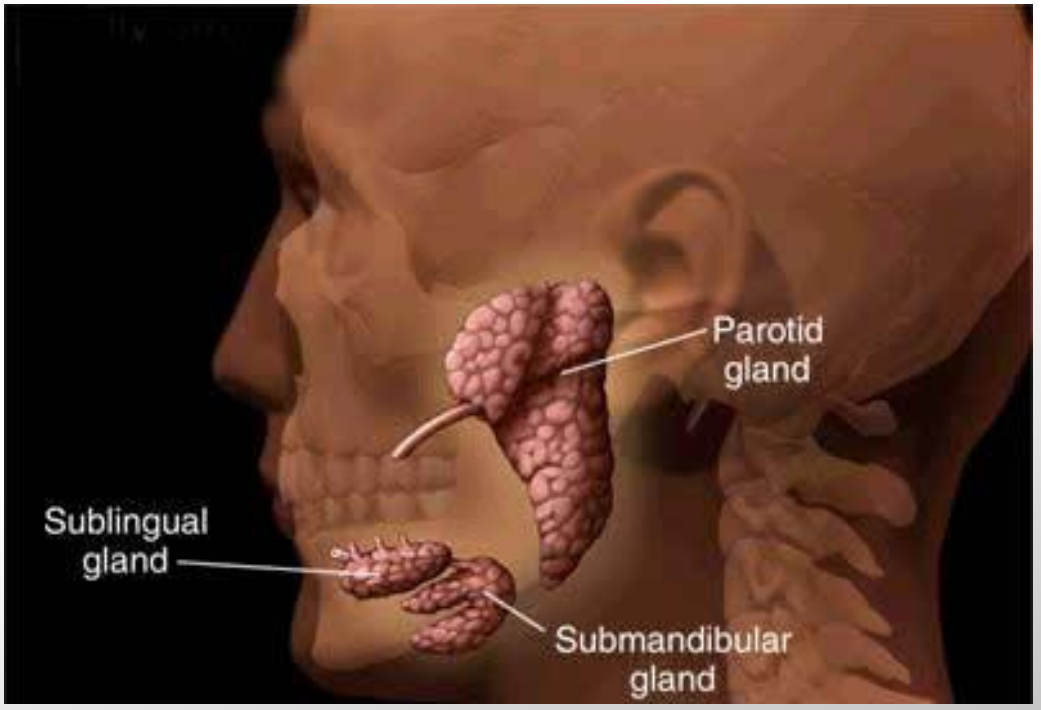
Egestion

Removal of food from the anus



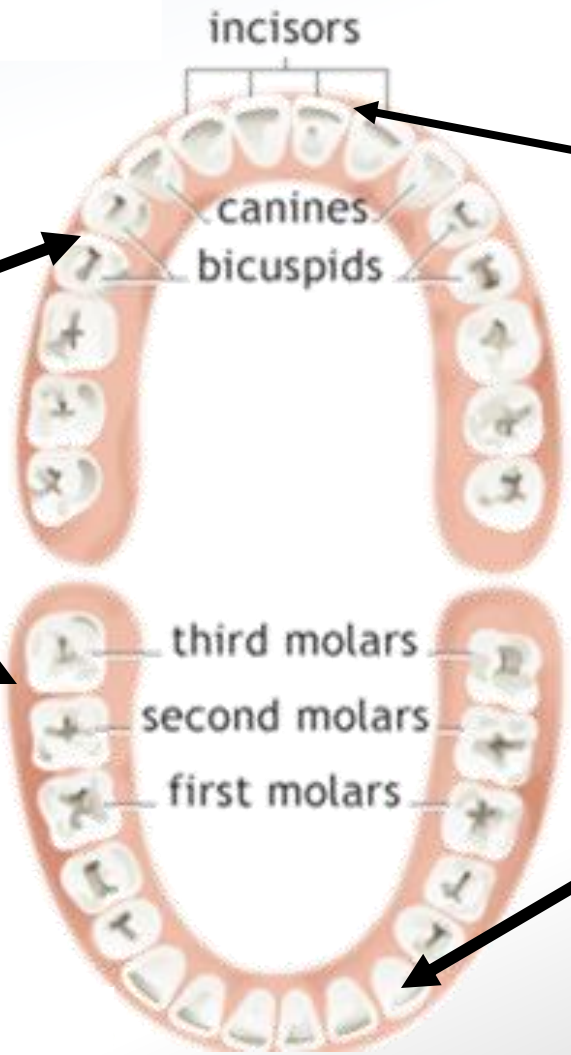
Ingestion is how we take in food using our mouths.

1. Canine and incisors teeth rip, tear and bite pieces of the food.
2. Suitable sized pieces of food enter the mouth.
3. Pre-molars and molars grind the food into smaller pieces.
4. Saliva is mixed with the food from the saliva glands.
5. Enzymes in the saliva start breaking down (digesting) the food.
6. Lumps of chewed food are swallowed down the esophagus.
7. Food moves into the stomach



How the different types of human teeth are used when eating.

There are 32 teeth in a full set of adult teeth.

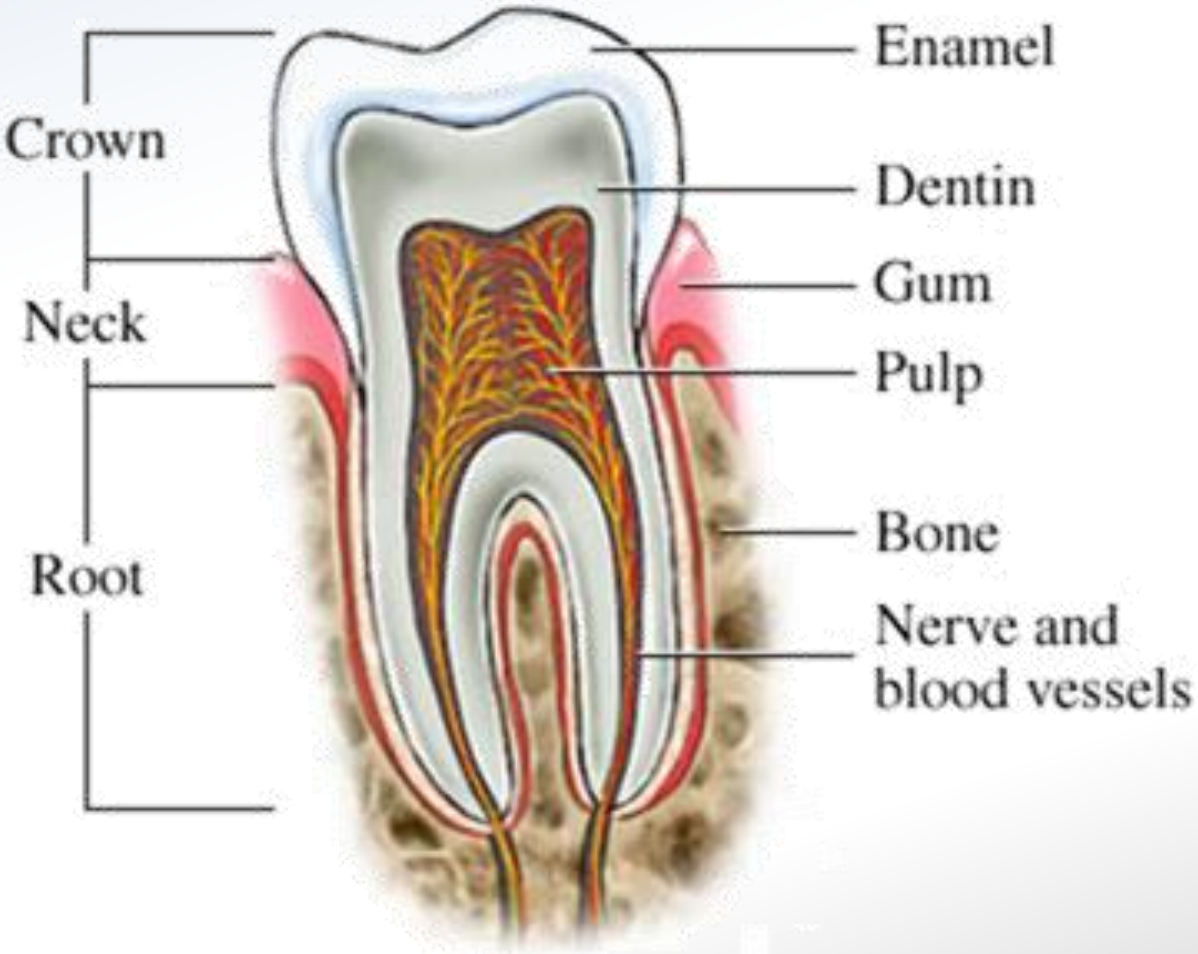


The incisors at the front of the mouth are used to bite pieces of food.

The bicuspids (also called premolars) and the molars at the back of the mouth are used to chew food.

The canines are bigger and used to tear food.

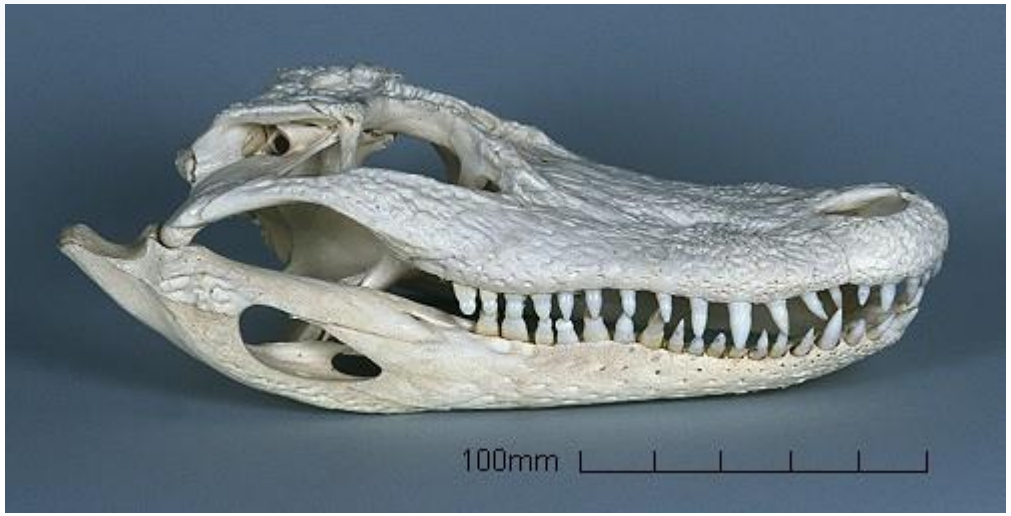
The internal structure of a human tooth.



The tooth has a hard covering of **enamel** which protects it and gives it strength to bite and chew food. When tooth decay occurs the enamel is eaten away by bacteria and tooth pain occurs because acid and infection reach the **dentine** and tooth nerves. The tooth is embedded into the jaw bone by the **roots** which secure it.

How the different types of Animal (carnivores) teeth are used when eating.

Tiger carnivorous cat



Alligator carnivorous reptile

extra info

Otter carnivorous fish eater

Sharp pointed canines

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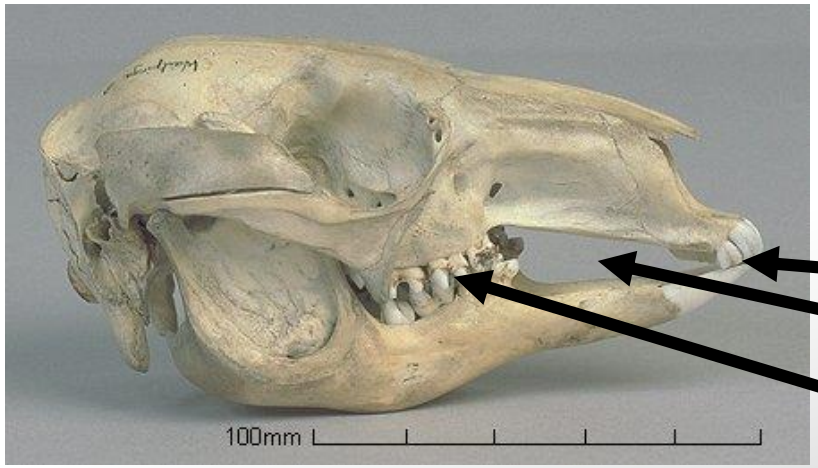
How the different types of Animal (Herbivores) teeth are used when eating.

Horse grazing herbivore

Rabbit grazing rodent

extra info



Grey kangaroo Australian grazing marsupial

Chisel-like incisors

No canines

Grinding molars

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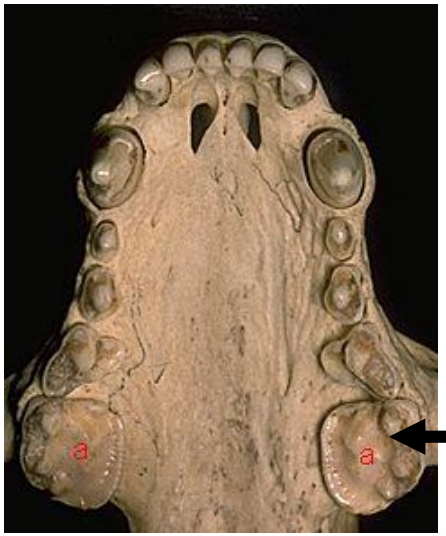
How the different types of Animal (omnivores) teeth are used when eating.

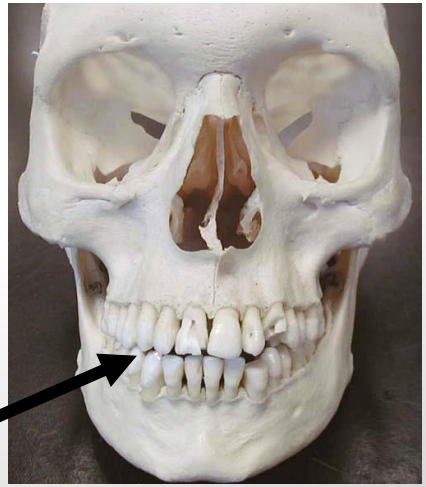


Badger eats more animals than plants.

Flattened molars to grind plants

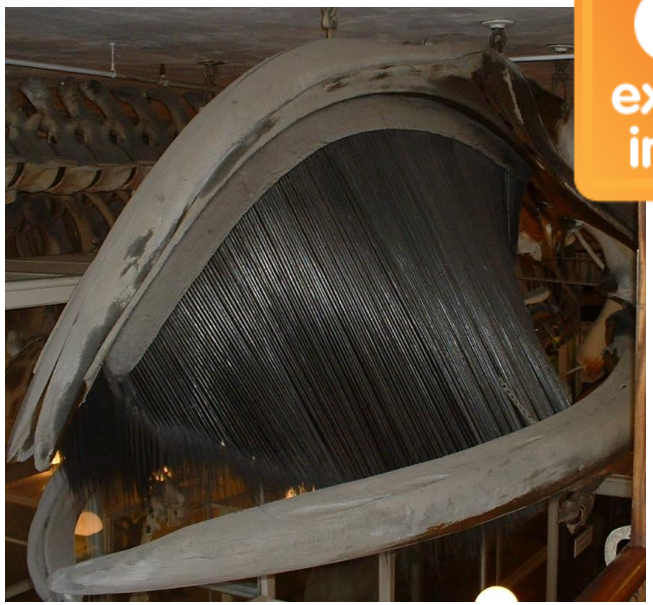
Human eats more plants than animals

Canines much smaller



How the different types of Animal teeth (specialist) are used when eating.

Baleen whales The specialized filter-feeding mechanism of baleen whales enables them to feed low on the food chain by primarily eating zooplankton and schooling fishes.



extra info

Giant Anteater sucks up ants with long tongue and has no need for teeth at all.

The gut is a coiled tube and is the site of digestion and absorption.

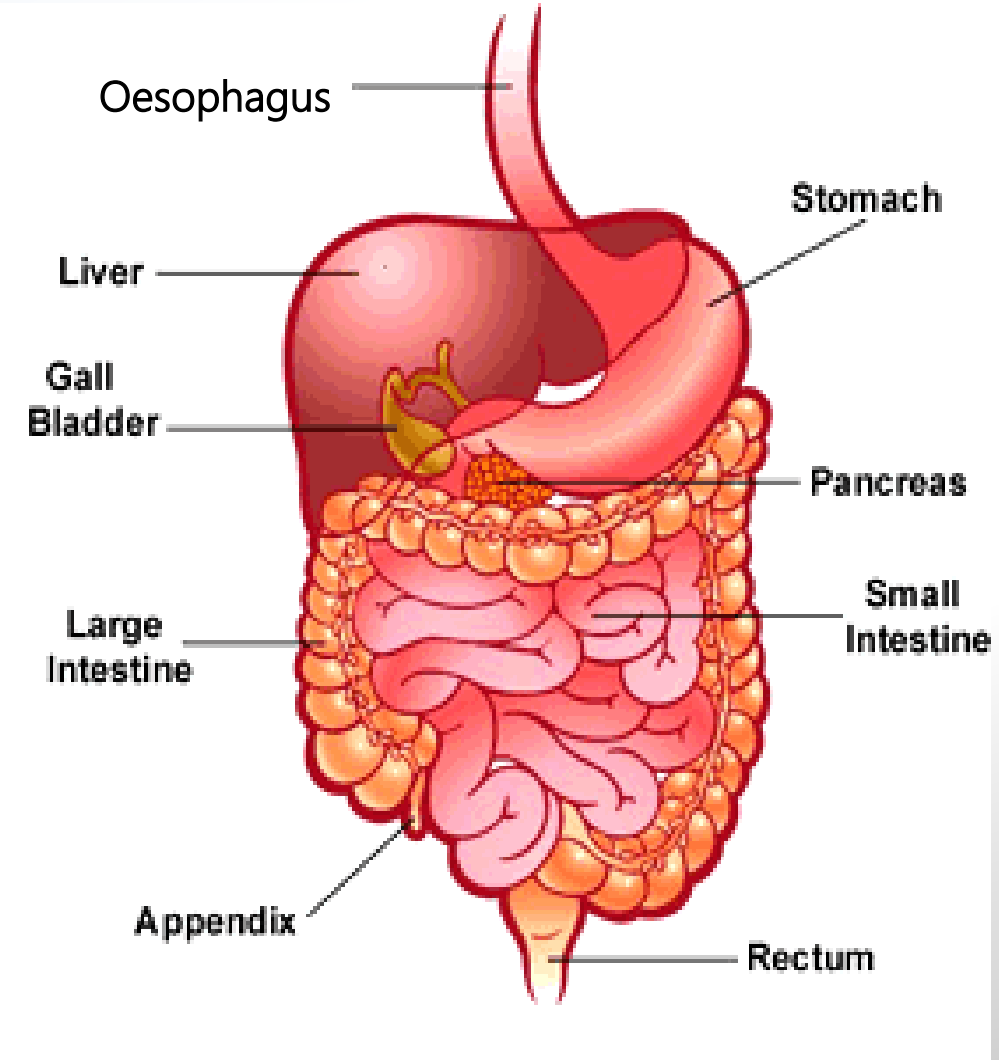
The second stage in food processing is digestion

Definition Digestion
Breaking food into smaller soluble molecules

Once food is ingested it moves down into the oesophagus and then into the stomach

Definition Oesophagus
The tube that food travels from the mouth to the stomach through

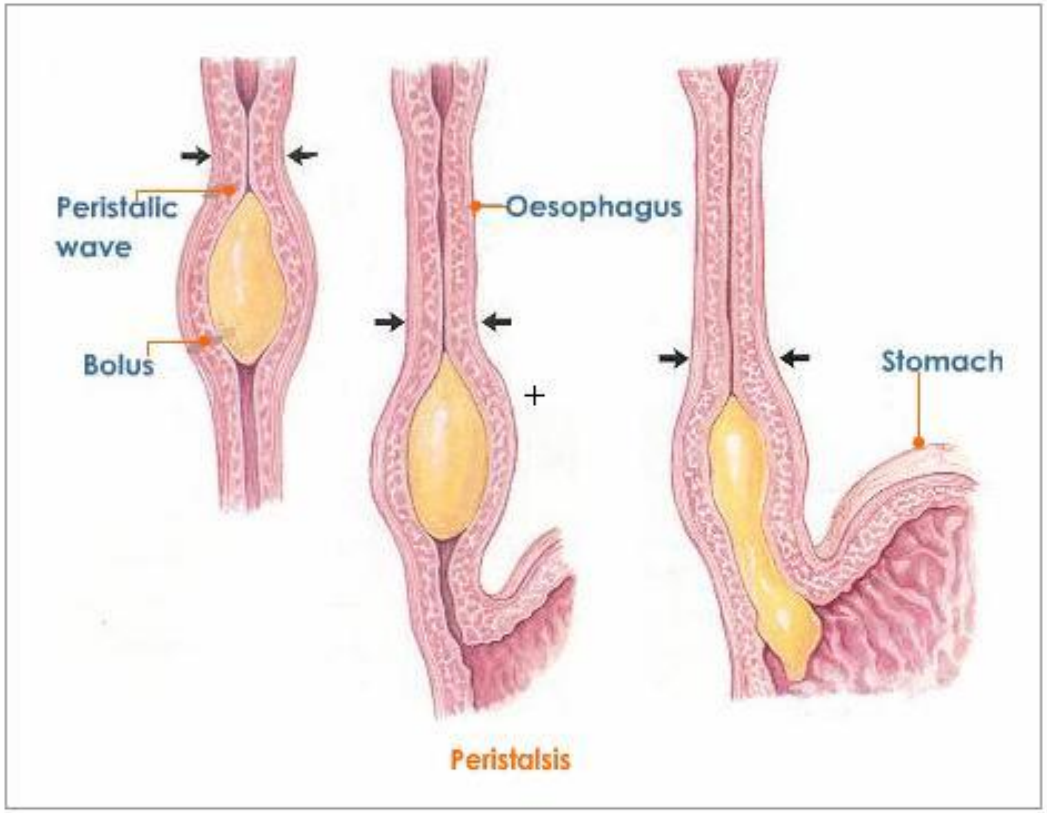
Definition Stomach
Organ from the digestive system that digests food



Oesophagus.

The **oesophagus** is like a stretchy pipe that's about 25 centimeters long. It moves food from the back of your throat to your stomach. When you swallow a small ball of mushed-up food or liquids, a special flap called the **epiglottis** closes over the opening of your windpipe to make sure the food enters the oesophagus and not the windpipe.

Once food has entered the oesophagus muscles in the walls move in a wavy way to slowly squeeze the food through the oesophagus (peristalsis) and into the stomach.



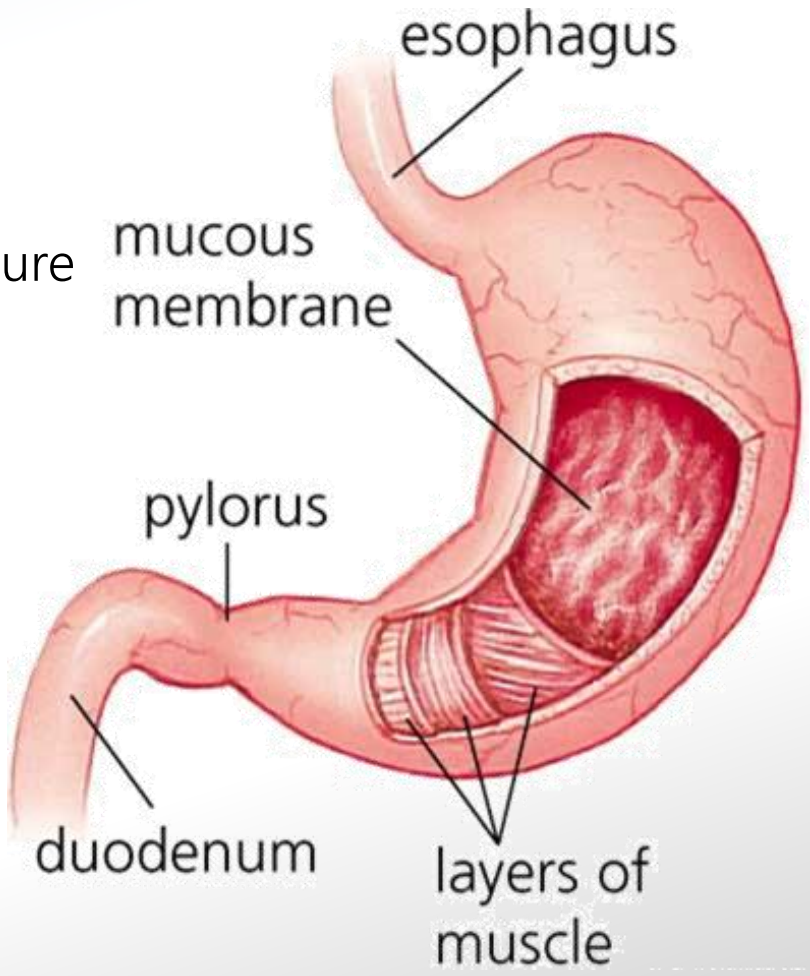
Stomach.

Your stomach is attached to the end of the oesophagus.
It has three important functions:

- ❑ to store the food you've eaten
- ❑ to break down the food into a liquid mixture
- ❑ to slowly empty that liquid mixture into the small intestine

The stomach mixes, churns and mashes together all the small pieces of food into smaller and smaller pieces.

It does this with help from the strong muscles in the walls of the stomach and **gastric juices** that also come from the stomach's walls.
In addition to breaking down food, gastric juices also help kill bacteria that might be in the eaten food.

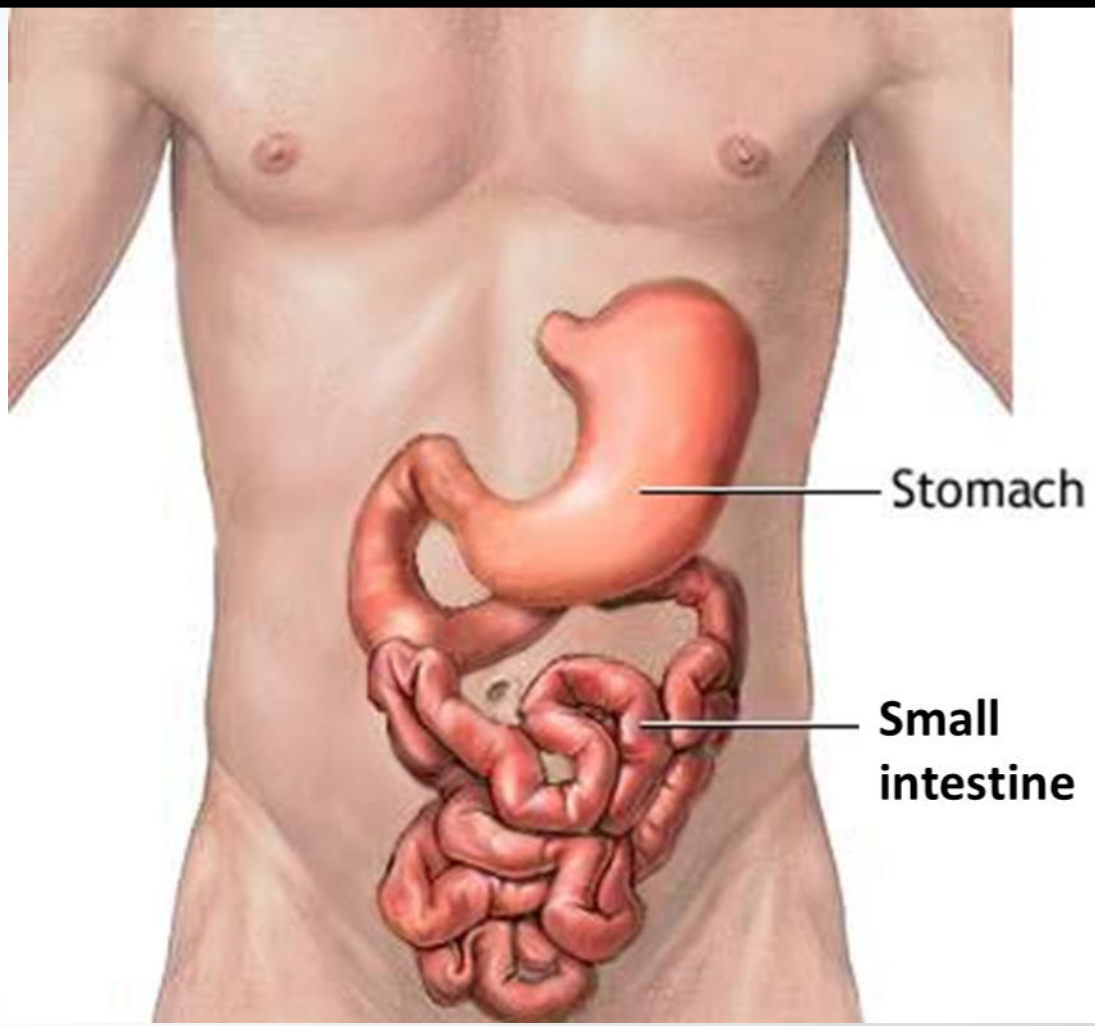


Small intestine.

The **small intestine** is a long tube around 3.5 to 5 centimeters around, which connects from beneath your stomach and is about 7 meters long.

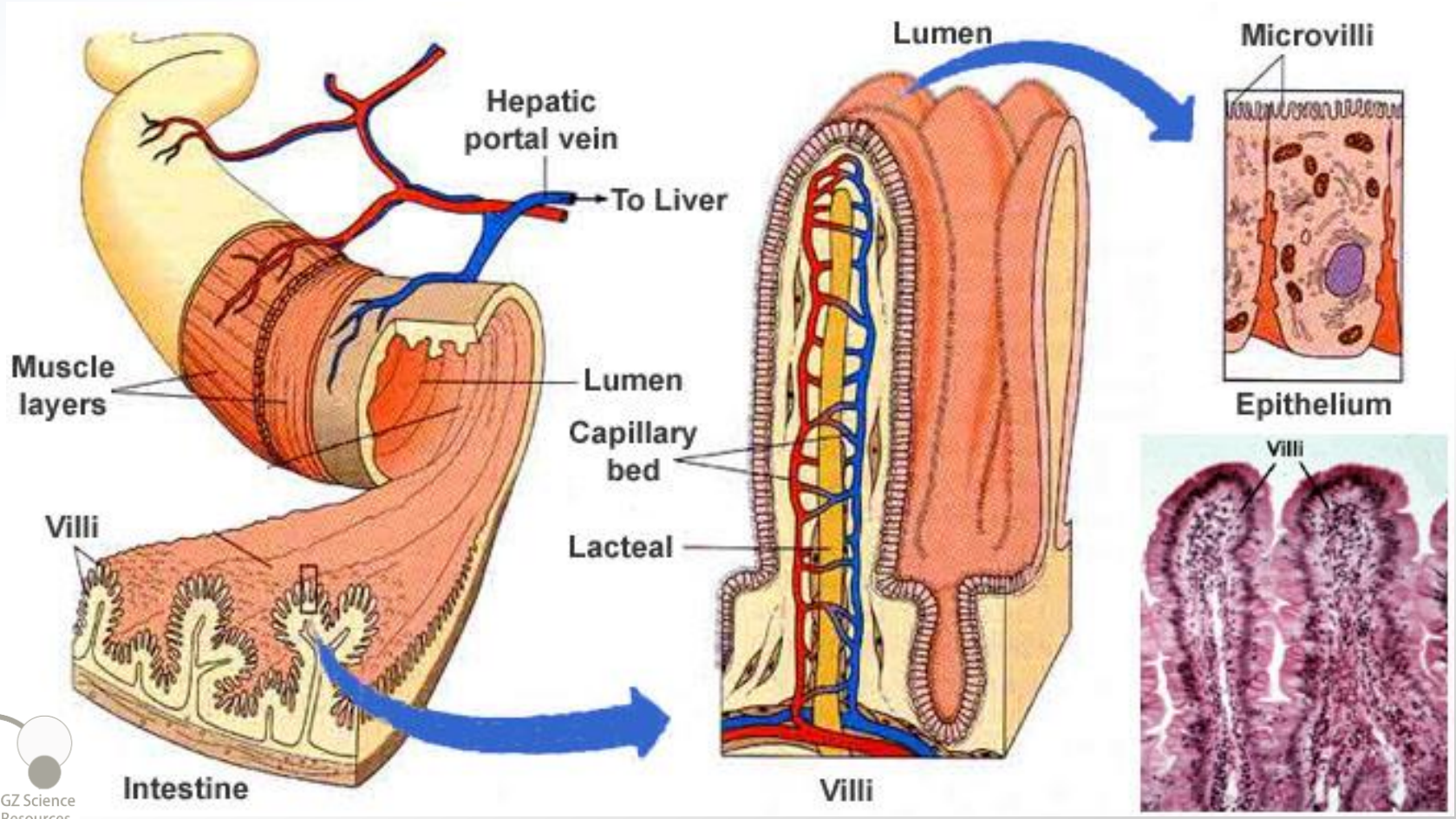
The small intestine breaks down the food mixture even more so your body can absorb all the vitamins, minerals, **proteins**, **carbohydrates**, and **fats**.

Food may spend as long as four hours in the small intestine and will become a very thin, watery mixture which can pass from the intestine into the blood.



The small intestine is the site of absorption of the products of digestion.

The walls of the small intestine are covered in protruding **villi** which increase the **surface area** and provide close contact for capillaries to absorb small food particles through the wall.



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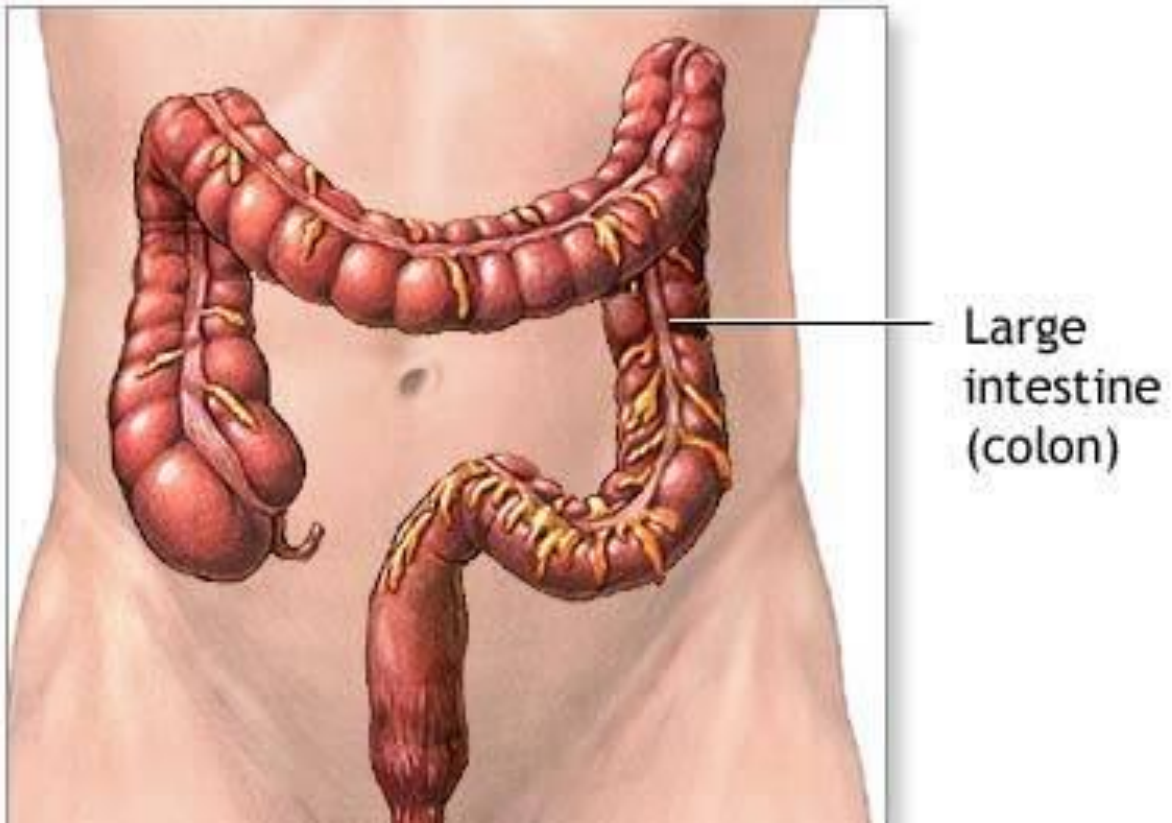
Large intestine.

The **large intestine** is about 7 to 10 centimeters, which is wider than the small intestine from which it joins on. It would measure about 1.5 meters long spread out.
Most of the nutrients have already been removed from the food mixture before it enters but there is waste and water left over.

Before it leaves the large intestine, it passes through the part called the colon where the body is able to absorb the water and some minerals into the blood.



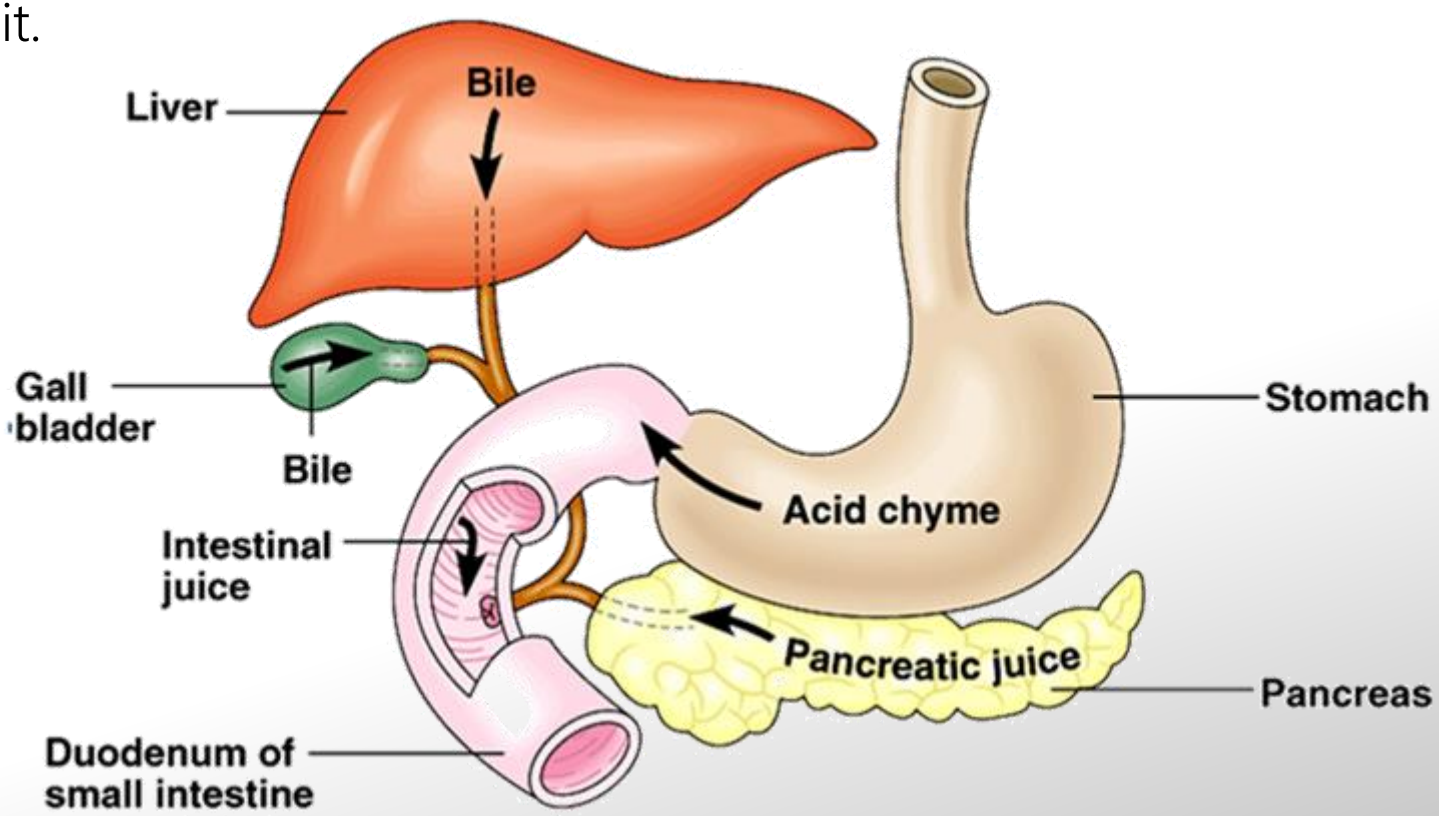
Pancreas, gall bladder and liver.

These organs send different juices to the first part of the small intestine. These juices help to neutralize stomach acid, digest food and allow the body to absorb nutrients.

The **pancreas** makes enzymes that help the body digest fats and protein.

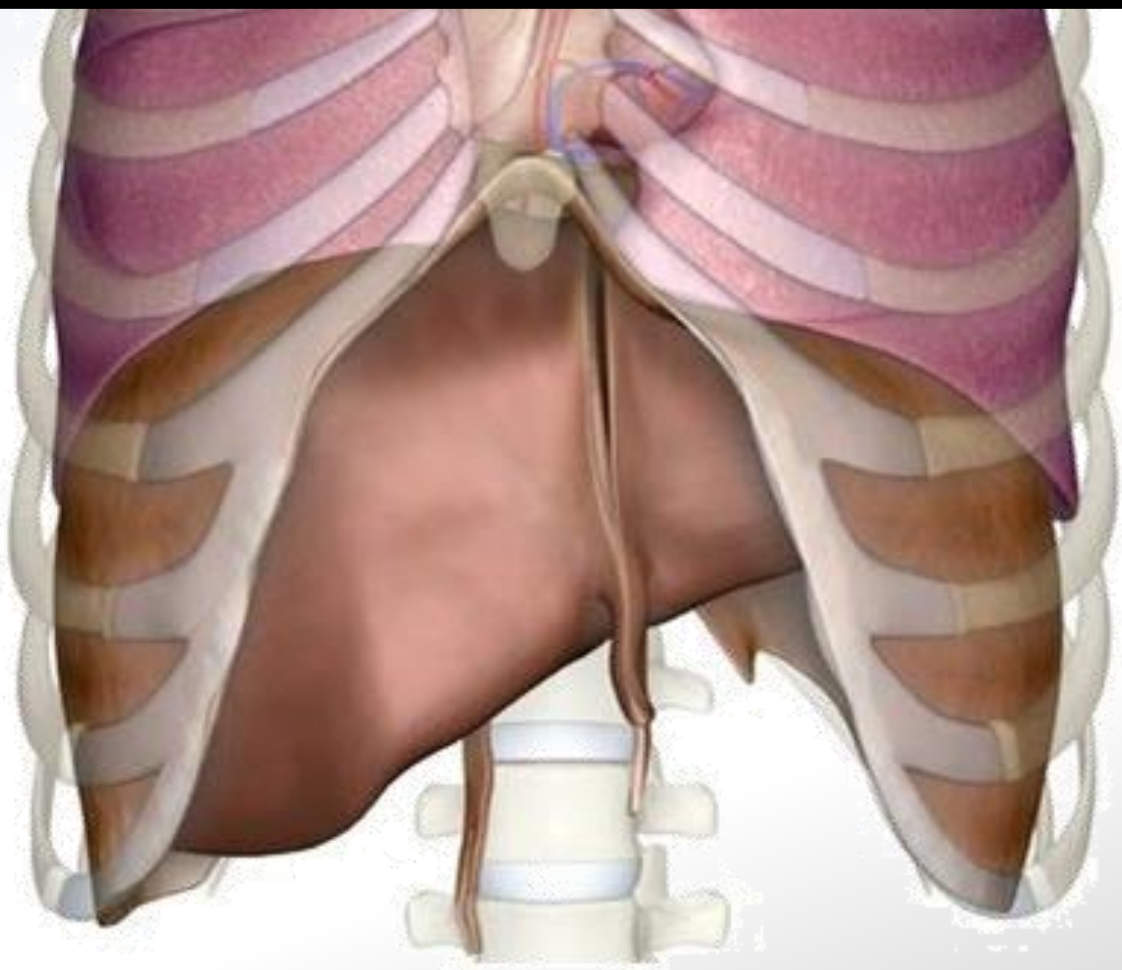
Enzymes from the **liver** called **bile** helps to absorb fats into the bloodstream.

The **gallbladder** serves as a warehouse for bile, storing it until the body needs it.



The Liver.

The nutrient-rich blood comes directly to the liver from the small intestine for **processing**. The liver filters out harmful substances or wastes, turning some of the waste into more bile. The liver sorts how many nutrients will be distributed to the body, and how many will stay behind in **storage**. The liver stores certain vitamins and a type of sugar your body uses for energy.



Rectum and Anus.

The final stage of food processing is **egestion**, where the waste food that hasn't been absorbed is moved through the rectum and out of the body through the Anus.

Definition

Egestion

Removal of wastes from the anus

Definition

Anus

part of the digestive system through which wastes exit the body