

Human Nutrition

THE DIGESTIVE SYSTEM

Digestion is the physical and chemical breakdown of food.

The digestive system or the alimentary canal is a long tube starting at the mouth and ending at the anus.

MAIN EVENTS IN HUMAN NUTRITION

1. **Ingestion** is the taking of food into the digestive system.
2. **Digestion** is the breakdown of food → **Physical** digestion is the **mechanical** breakdown of food.
→ **Chemical** digestion is the breakdown of food using **enzymes**.
3. **Absorption**: digested food passes from the digestive system and enters the **bloodstream**.
4. **Egestion** is the **removal** of **unabsorbed waste** from the digestive system.

MOUTH

Types Of Teeth

1. **Incisors** are found at the front of the mouth. They are shaped like chisels and they cut and slice food.
2. **Canines** are the long, pointed, fang-like teeth. They are used to grip and tear food.
3. **Premolars** have large, flat surfaces and are used to crush and grind food.
4. **Molars** are the large teeth located at the back of the jaw. They also crush and grind food.

The dental formula for an adult human is **2(I2/2 C1/1 P2/2 M3/3) = 32 teeth in total**

Digestion In The Mouth

1. **Mechanical digestion** takes place in the mouth by the **chewing** and **grinding** of teeth on food.
2. **Chemical digestion** occurs in the mouth by the action of the enzyme **amylase** found in saliva and breaks down **starch** into **maltose**.

Food is formed into a ball called a **bolus** and pushed backwards into the **pharynx** which connects the mouth to the **oesophagus**. A flap called the **epiglottis** closes over the trachea and ensures the food passes down the oesophagus.

OE SOPHAGUS

The oesophagus (**food pipe**) carries food to the **stomach** by an involuntary wave of muscular contraction called **peristalsis**:

- Helps **break down** food mechanically
- **Forces** food into the small intestine, large intestine and rectum.

Dietary fibre (**roughage**) is made of **cellulose**. Fibre **stimulates peristalsis** and absorbs/stores water.

STOMACH

The stomach is a **muscular bag** that **stores and digests** food.

It is lined with **mucosa** and is heavily fold to form millions of **gastric glands** which produce **gastric juice** (mucus, pepsinogen and HCL)

Mucus coats the stomach and **prevents self digestion**.

Pepsinogen (pepsin) is an **inactive enzyme** that turns **protein** → **peptides**

The **HCl** kills bacteria, loosens fibrous and cellular food, activates pepsinogen (turns into pepsin) and denatures amylase.

The **contraction** of the stomach **digests** the food and turns it into a thick soupy mixture called **chyme**.

PANCREAS

The pancreas secretes the hormone **insulin** and digestive materials which form **pancreatic juice**.

This juice consists of **sodium bicarbonate** (which neutralises chyme), **amylase** and **lipase** (acts on lipids).

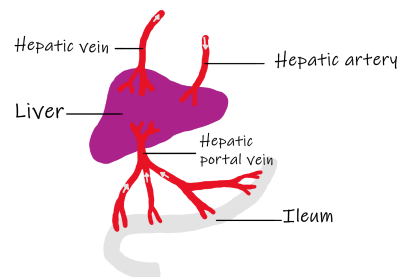
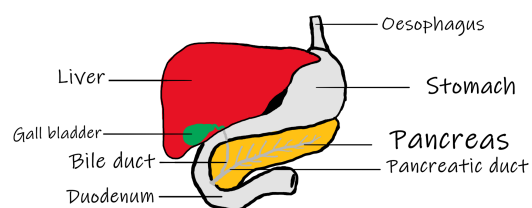
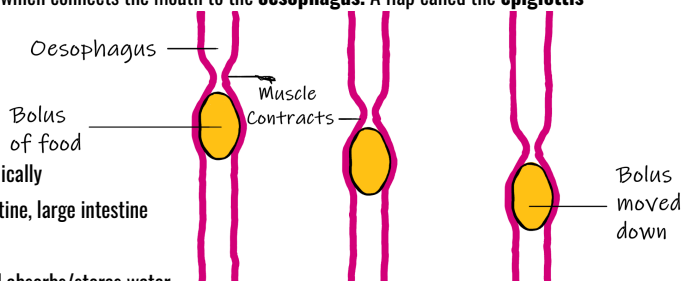
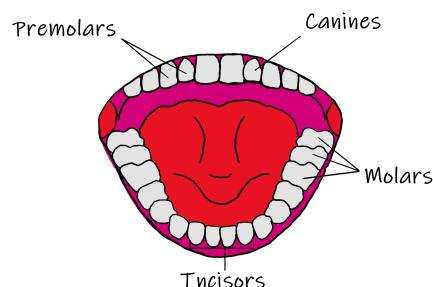
LIVER

The liver breaks down **red blood cells**.

It makes **bile** (bile salts, pigments and water) that is stored in the **gallbladder** and **neutralises chyme**.

It **detoxifies** (breaking down poisons - alcohol and drugs) and **breaks down excess amino acids** to form **urea**.

It stores **vitamin D** and **minerals**, makes **cholesterol** and produces heat.



THE SMALL INTESTINE

1. Duodenum (site of digestion)

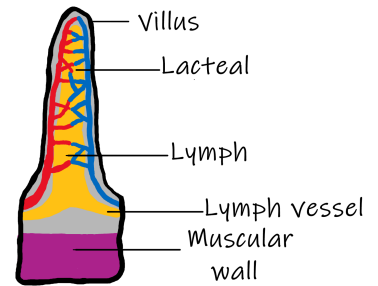
Produces **digestive enzymes** and products of the liver and pancreas enter the duodenum.

The **inner lining** contains **infolding** called **villi**, which contain **microvilli** (increases the surface area)

Intestinal glands between the villi produce a range of enzymes.

Digestion produces:

1. Carbohydrates → **Monosaccharides**
2. Proteins → **Amino Acids**
3. Lipids → **Fatty acids** and **glycerol**



2. Ileum (absorption)

Contains **villi** which have **special adaptations**: there are large numbers of them to increase surface area, they are very thin to increase absorption, and they have a rich blood supply.

Glucose and **amino acids** are absorbed into the bloodstream by **diffusion** and are carried to the liver by the **hepatic portal vein**.

Fatty acids and **glycerol** pass into the **lacteals** (contain **lymph**) which are in the centre of each villus.

The adaptations of the small intestine are:

1. It is very **long**.
2. It has **numerous villi** and **microvilli**
3. It has a **rich blood supply** to carry away **water soluble products**
4. Each villus has a **lymph supply** to carry away fats.

THE LARGE INTESTINE

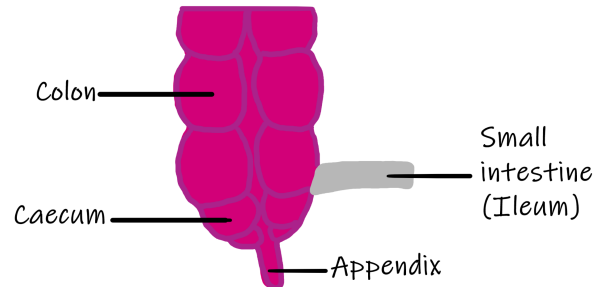
The part of the large and small intestines which connect the two is called the **caecum**.

The end of the caecum is called the **appendix**.

In **herbivores**, the caecum and appendix **break down cellulose** but in humans they are **vestigial organs** meaning they have lost their former use.

The **colon** **reabsorbs water from waste**, forming **faeces**.

Bacteria in the colon feed on the waste to produce **vitamin B** and **vitamin K** which are **reabsorbed**. They are **symbiotic** bacteria and prevent the growth of **pathogenic** bacteria and fungi.



Excretion