

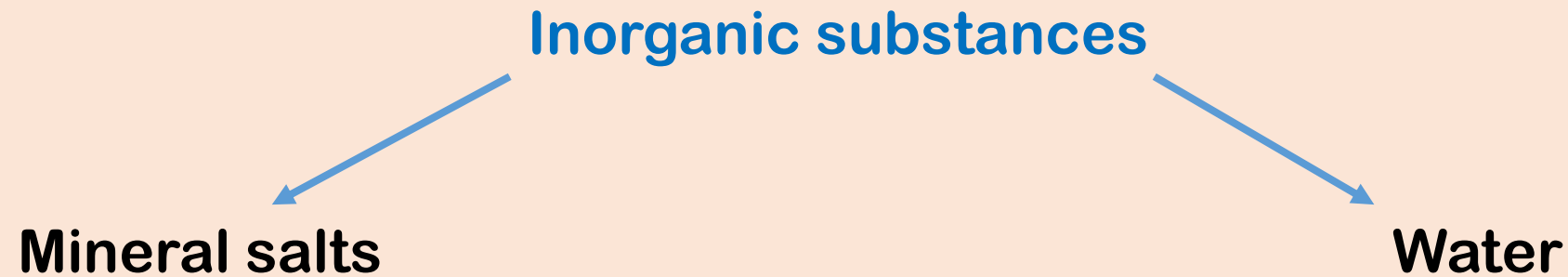
# FROM FOOD TO NUTRIENTS





# THE COMPOSITION OF FOOD

Food are composed of same basic molecules, inorganic and organic molecules.



They provide structural strength for example in our bones and teeth and they are also found dissolved in all our body fluids, such as our blood and tears. Our mineral salt requirements are quite small

It's the most abundant chemical compound in our bodies and the medium in which the lives of all cells occur. We replenish the lost water from drink and food



# THE COMPOSITION OF FOOD

## Organic substances

### Carbohydrates

(Hidratos de carbono)

. **Simple carbohydrates:** For example glucose and sucrose. Taste sweet and are known as sugars. Glucose is a simple sugar or monosaccharide, one that cannot be broken down into smaller carbohydrates.

. **Complex carbohydrates:** starch (almidon), glycogen (glucógeno) and cellulose (celulosa). Do not taste sweet. They are macromolecules, substances that are the product of assembling many smaller molecules

### Lipids

(Lípidos)

Fats can be broken down into simple molecules, namely glycerol (glicerol) and fatty acids (ácidos grasos).

. **Unsaturated fats:** Plant origin, They are liquid at room temperatura (olis)

. **Saturated fats:** Animal origin. Solid at room temperatura (butter)

### Proteins

(Proteínas)

They are macromolecules formed by the unión of hundreds or even thousands of smaller molecules called amino acids.

There are twenty different types. Proteins differ in the number, type and sequence of their amino acids

### Vitamins

(Vitaminas)

Our body need very small quantities of these molecules and they are essential for its proper function.

Most vitamins are obtained from our diet because our bodies can not synthesise them.

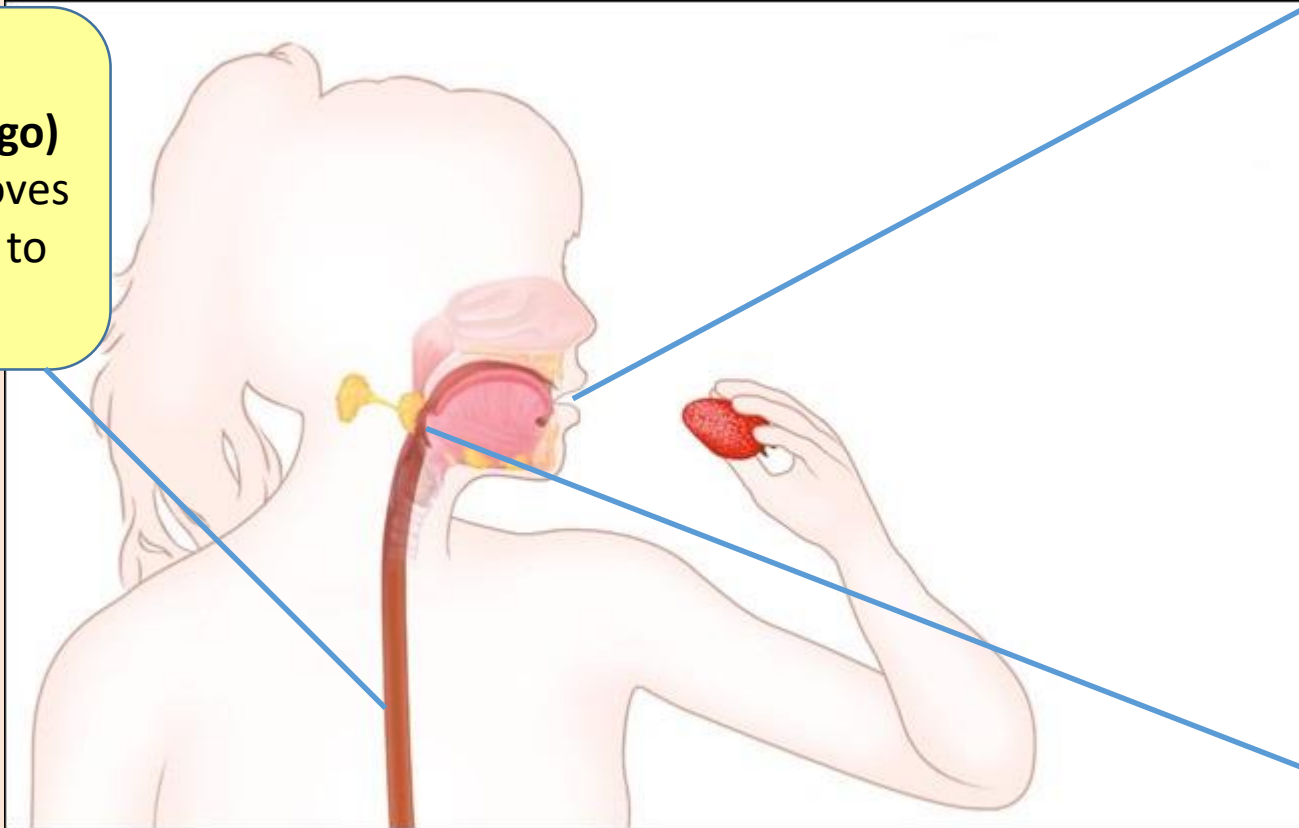


# DIGESTIVE TRACT I

It's the passageway from the mouth to the anus

## Oesophagus (Esófago)

Passageway that moves food from pharynx to the stomach



## Mouth (Boca)

It is the opening of the digestive tract. It contains the teeth and tongue. The teeth are made of dentine. The innermost part is called pulp.

The tongue is a muscular structure with an abundance of taste buds (papilas gustativas)

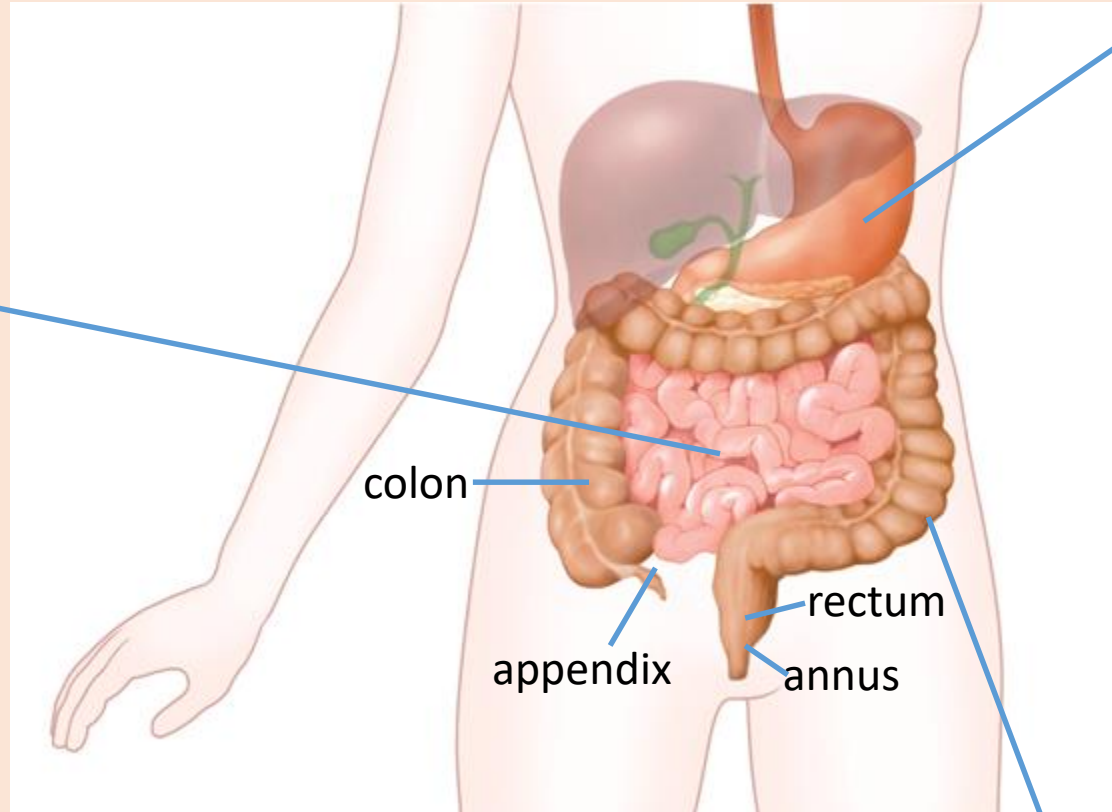
## Pharynx (Faringe)

Serves both the digestive and respiratory systems. Food passes through it on its way to oesophagus.



# DIGESTIVE TRACT II

**Small intestine (Intestino delgado)**  
 Long tube, folded several times, that communicates the stomach with the large intestine.  
 It's divided in 3 parts:  
**Duodenum** (duodeno), **jejunum** (yeyuno) and **ileum** (íleon)



**Stomach (Estómago)**  
 It's the thickest region of the digestive tract. The stomach wall contains a strong layer of muscle. The entrance of the food from the oesophagus is made through a valve or sphincter called **cardiac sphincter (cardias)**. The **pyloric sphincter (piloro)** is located at the end of the stomach

**Large intestine (Intestino grueso)**  
 The key region is in the shape of an inverted U and is called **colon**. At the junction between small intestine and large intestine we find the **caecum** (ciego), a bag that carries a fine extension called **appendix** (apéndice). The last segment of the colon is the **rectum** (recto) that finish in the **anus** (ano)

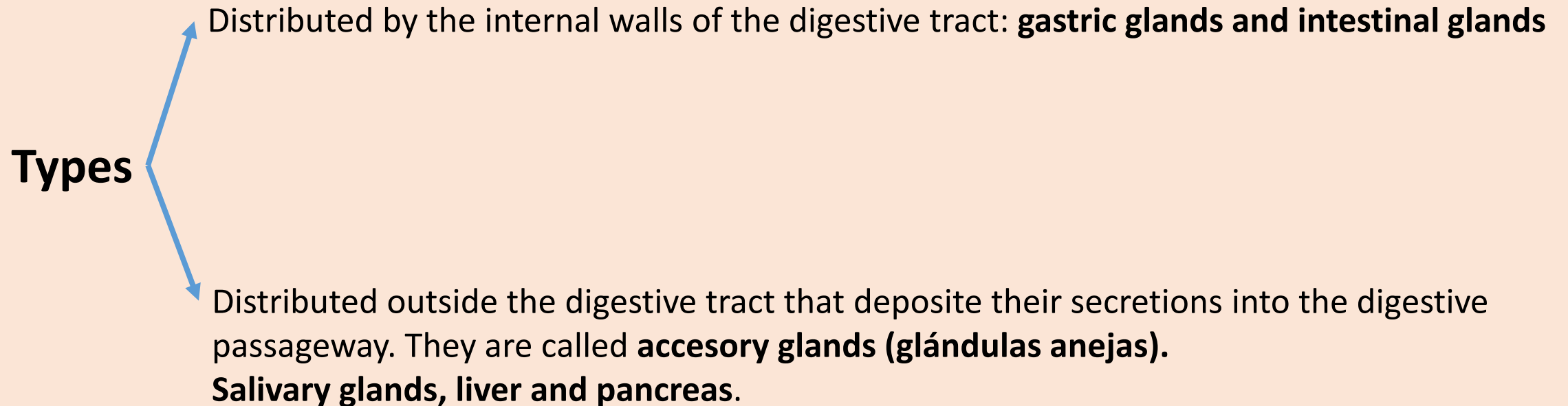


# DIGESTIVE TRACT II

## THE DIGESTIVE GLANDS



They are responsible for producing digestive juices and releasing them into the digestive tract. These substances contain **digestive enzymes**, proteins that speed up the conversion of large food molecules into usable nutrients.



# DIGESTIVE TRACT II

## THE DIGESTIVE GLANDS

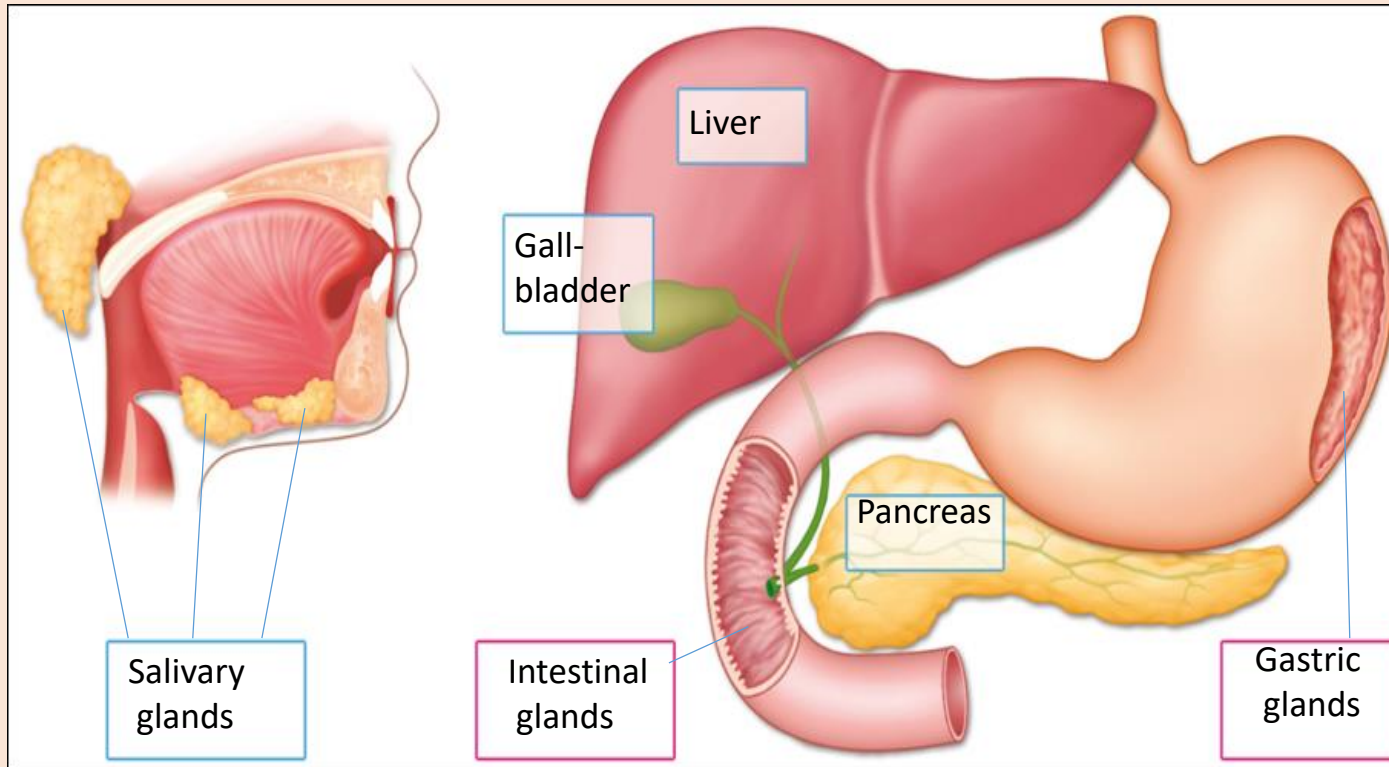
DIGESTIVE SYSTEM



### Salivary glands (glándulas salivares)

They are located beneath the tongue as well as behind the mandible.

They produce saliva and release into the mouth.



### Pancreas

It's located on the left side of the abdomen, below the stomach. It produces the **pancreatic juices** (jugo pancreático) which are released into the duodenum

### Liver (hígado)

It's the largest gland in the human body and weights about 1,5 kg. It produces **bile (bilis)**, which goes on to be stored in the **gallbladder (vesícula biliar)**. When food rich in fat enters the duodenum, the gallbladder releases bile to aid the digestion of these molecules. Bile doesn't contain enzymes but exerts an effect on fats similar to soap: emulsifies, that's to say, fragments them into very small drops to facilitate the action of enzymes on the fats.

The liver also stores carbohydrates, iron, and some vitamins and helps to eliminate medicines or toxic substances such as alcohol from the blood

# THE STATES OF DIGESTION



Digestion: Transformation that food undergoes as it passes through the digestive system

## MOUTH

**Mechanical digestion: Grinding** (masticación) is a mechanical process which consists of crushing food into smaller pieces to facilitate the digestive process.

**Chemical digestion:** The food mixes with saliva. When mixed with the crushed food forms a mass called **chewing or alimentary bolus (bolo alimenticio)**. Saliva has several functions:

- Facilitates the passage of the bolus to the pharynx and esophagus
- Contains the enzyme **amylase (amilasa)** which begins the chemical breakdown of carbohydrates.
- Destroys some of the existing bacteria in food.

## PHARYNX

**Mechanical digestion:** The food moves from the mouth, through the pharynx, to the esophagus by **swallowing** (deglución)

## ESOPHAGUS

**Mechanical digestion:** The esophagus pushes the bolus to the stomach by contraction movements of the muscles of its walls called **peristalsis (movimientos peristálticos)**





# THE STATES OF DIGESTION

## STOMACH

**Mechanical digestión: Churning** (movimientos de mezcla). A constricting motion that mixes the food particles with the gastric juices.

**Chemical digestion:** The bolus reaches the stomach and mixes with the gastric juice. The resulting mixture constitutes the **chyme** (quimo), a mass more fluid than the bolus. The gastric juice contain:

- **Pepsin (pepsina):** An enzyme that starts the digestión of proteins
- **Hydrochloric acid (ácido clorhídrico):** On the one hand it activates pepsin, and the other hand it destroys the bacteria that the chyme may contain. The inner wall of the stomach are covered with mucus that protects and prevents it from being attacked by hydrochloric acid.

When the mixture reaches a certain degree of acidity, the pylorus opens and the chyme passes to the intestine



# THE STATES OF DIGESTION

## SMALL INTESTINE

**Mechanical digestion:** Peristalsis for the advance of food along the intestine and churning to facilitate the access of all substances and enzymes to food.

**Chemical digestion:** The chyme passes into the small intestine and into the duodenum comes into contact with secretions discharged by the pancreas and liver.

- **Liver:** It produces bile, which is stored in the gallbladder and poured into the duodenum. Bile doesn't contain enzymes, but there are some substances called bile salts that emulsify fats.
- **Pancreas:** Besides producing hormones, the pancreas secretes pancreatic juice that is poured into the duodenum. The pancreatic juice contains enzymes capable of digesting the molecules present in food (carbohydrates, lipids (**lipase**) and proteins) and, in addition, sodium bicarbonate, which neutralizes the acidity of the chyme preventing the damage of the intestinal cells.

In addition to the pancreatic juice and bile, the chyme is subjected to the action of intestinal juice. Therefore in the small intestine, fat is digested thanks to the lipase (lipasa) and the digestion of carbohydrates and proteins is finished, giving rise to a whitish mush, called **chyle (quilo)**. Chyle contains water and nutrients (monosaccharides, glycerin, fatty acids and amino acids) and other undigested products.



# INTESTINAL ABSORPTION

It's the process in which the nutrients pass from the digestive tract into the bloodstream.

## ABSORPTION IN THE SMALL INTESTINE

Most of the organic nutrients are absorbed here. It's a fast process thanks to its huge internal surface, more than 100 m<sup>2</sup>. This large area is due to:

- 7-8 metre-long small intestine
- Tiny finger-shaped projections called villi (vellosidades) give the inner surface a larger surface area. These villi are surrounded by capillaries.

## ABSORPTION IN THE LARGE INTESTINE

The majority of the water and mineral content that we obtain from our diet is absorbed by the large intestine. Additionally, the intestinal bacteria or intestinal flora that normally inhabit the colon produce several vitamins that we also absorb.

Food also contains certain substances that we cannot digest or absorb, which go on to form part of the faeces. Faeces are eliminated from the body through the anus, in a process called **defecation**.



# THE DIGESTIVE SYSTEM AND OUR HEALTH

## CONSTIPATION (Estreñimiento)

It's the difficulty to expel faeces from the body. It is normally due to a diet that lacks sufficient cellulose (found in fruit and vegetables) and a sedentary lifestyle.

## DIARRHOEA (Diarrea)

The abundant faeces have too much water content. This can become a serious concern if it persists, as the water loss can lead to dehydration.