Ashur University
College of Medicine

Grade 2
PHYSIOLOGY OF
GASTROINTESTINAL TRACT
(GIT)
Lec. 5

# Salivary secretions & Stomach secretions

Ass. Professor Internal Medicine

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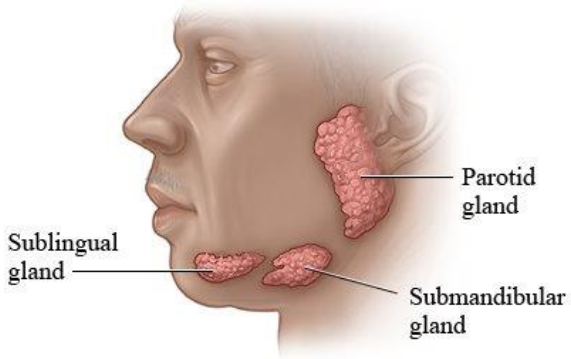
29/1/2025

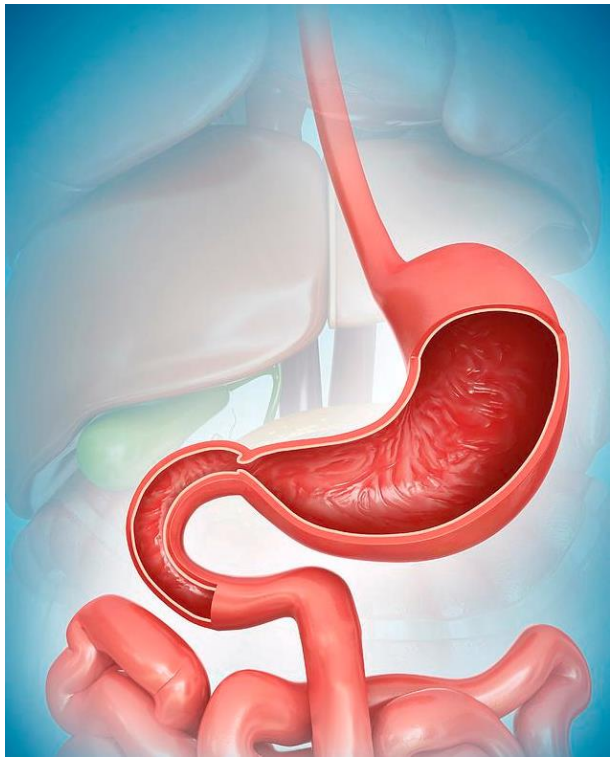





# Objectives:

- Describe the regulation of salivary secretion.
- Explain the functions of saliva.
- Outline the role of saliva in oral hygiene.
- Analyze the functions of the Stomach.
- Describe the composition of gastric juice





# SALIVARY GLANDS:

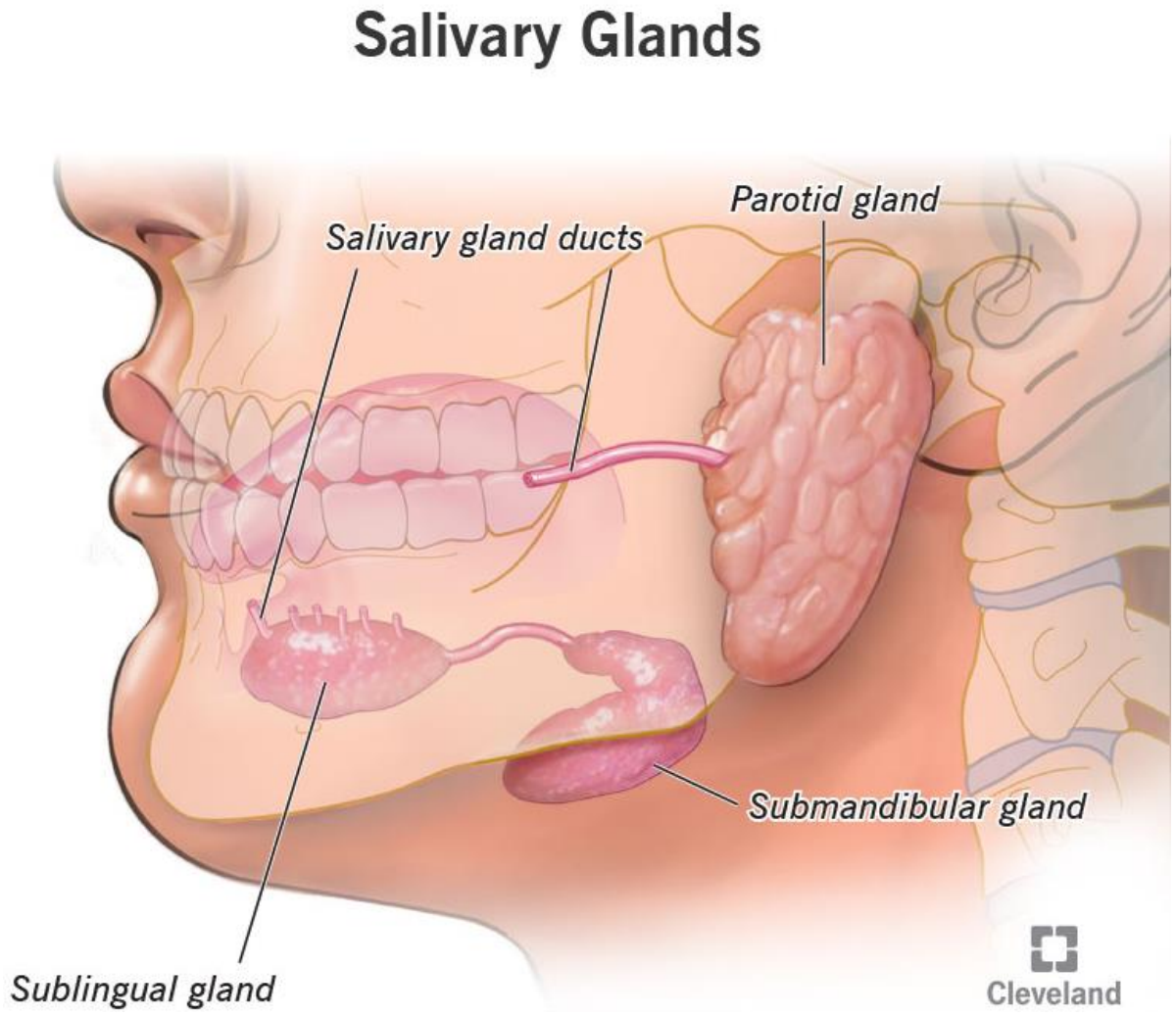
There are **3 chief paired salivary glands** these are:

**1- Parotid.**

**2- Submandibular (submaxillary).**

**3- Sublingual**

In addition, there are many tiny **buccal glands.**



# COMPOSITION OF SALIVA



- The daily secretion of saliva is about 1-1.5 liter , average value of 1 liter per day.

Ordinary mixed saliva contains:

- **Water 99.5%.**
- **Solids 0.5%.**

The solid materials are:

- Organic
- Inorganic (or electrolytes )

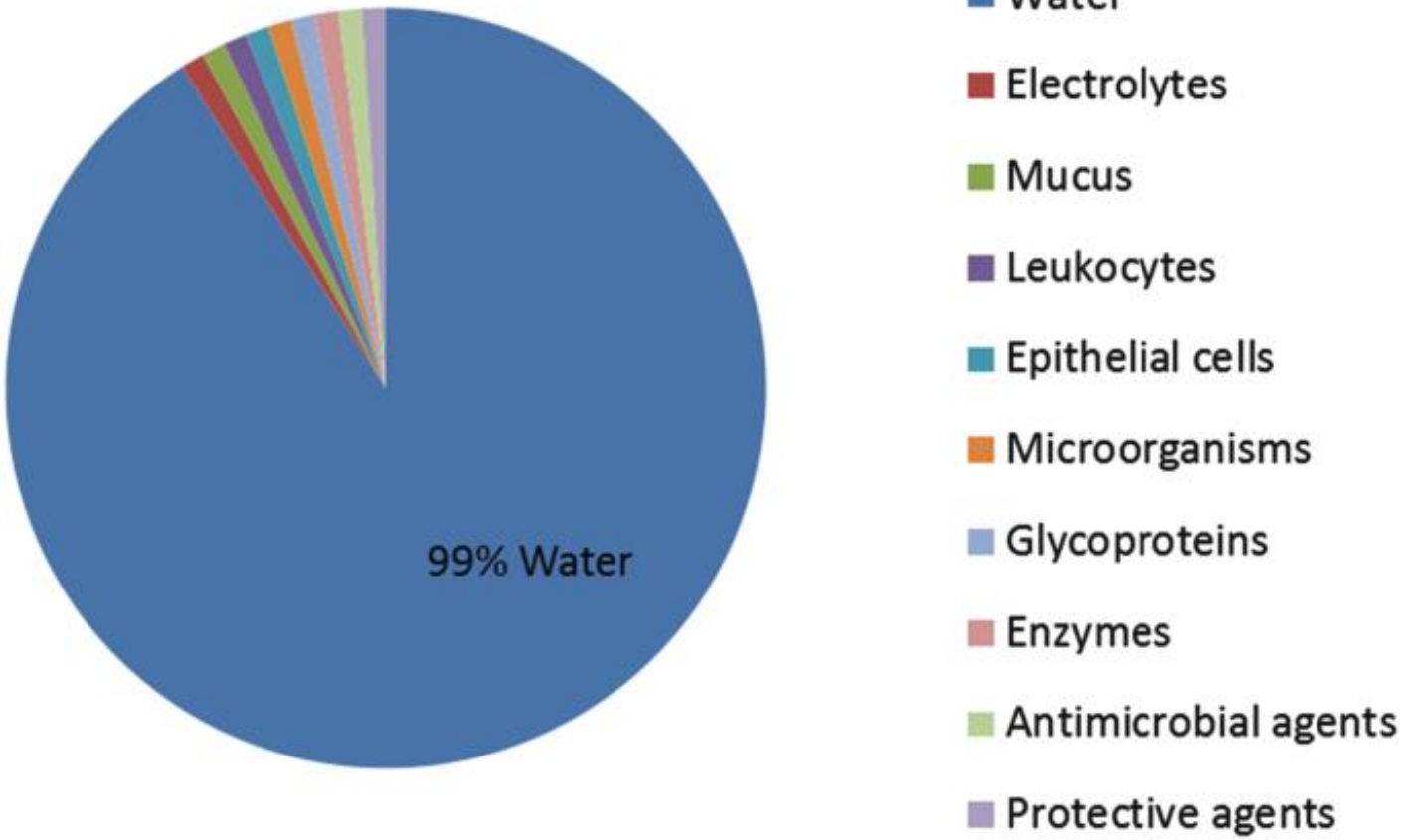
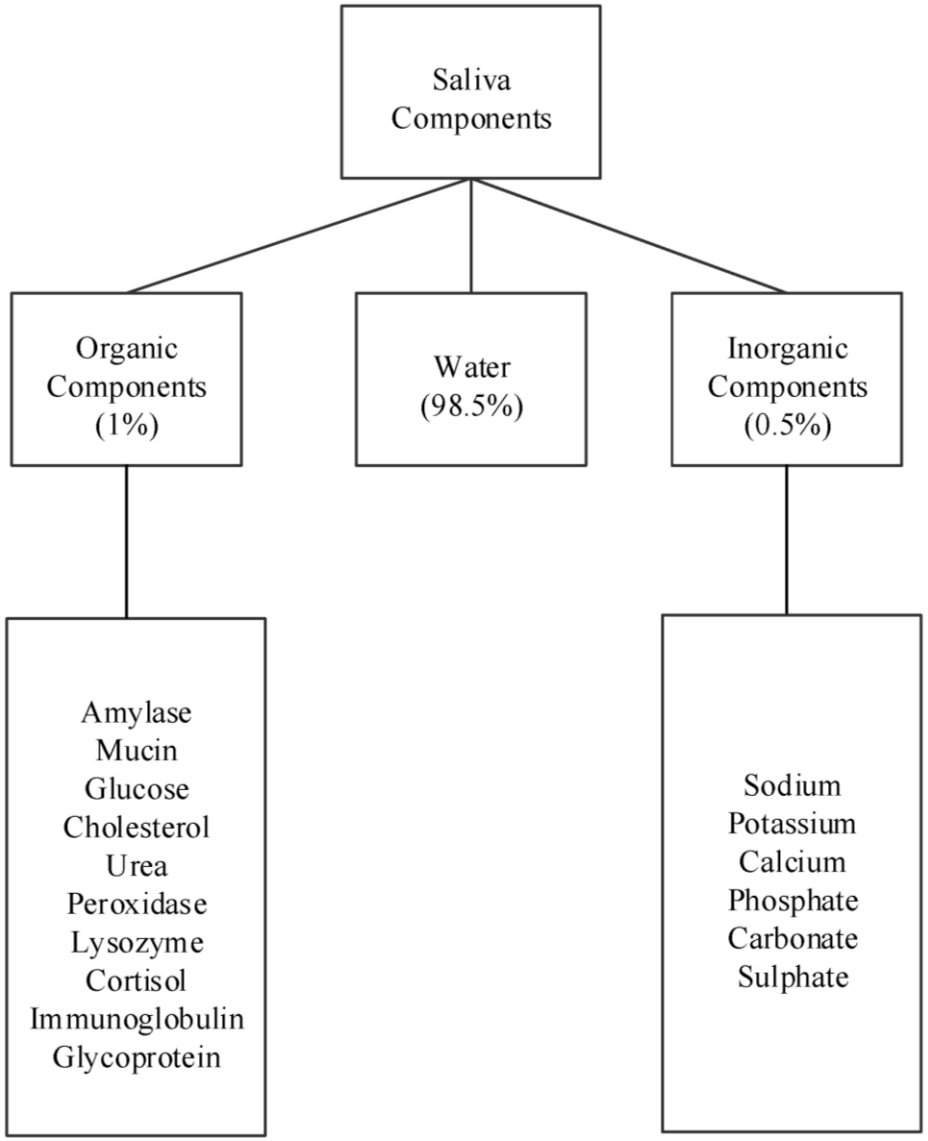
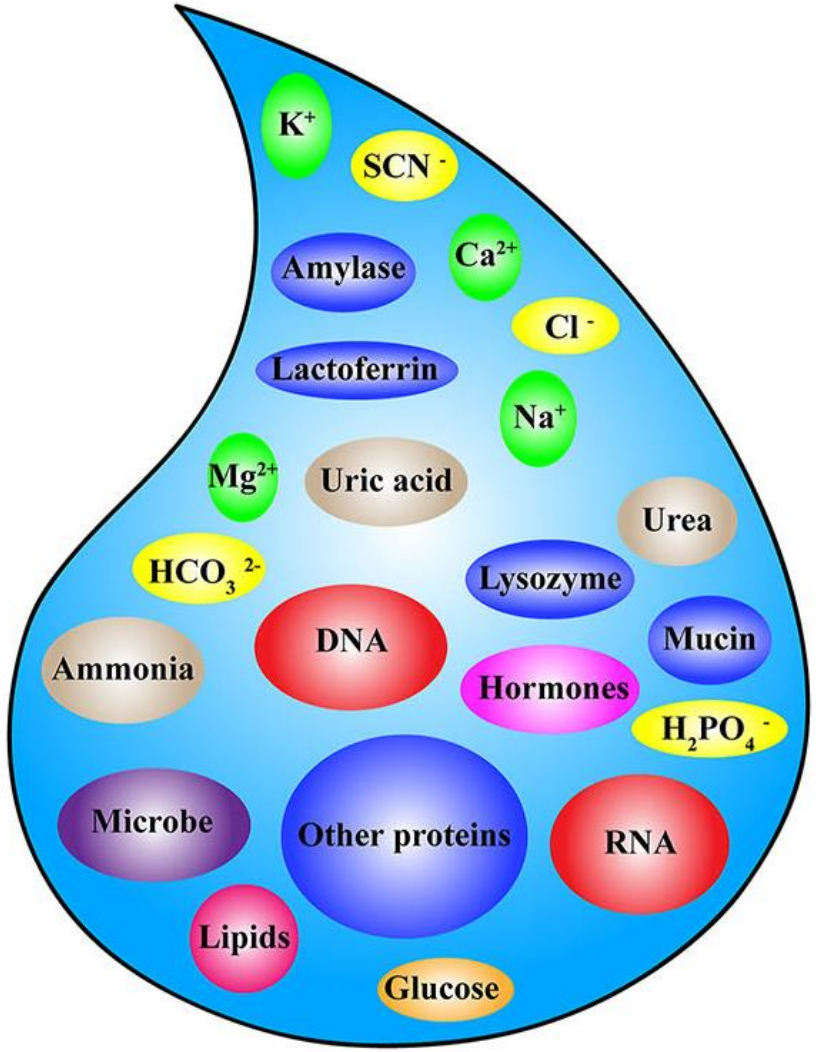





Fig: Components of saliva




Saliva

**Figure:**

**Components of human saliva.**

## Organic constituents of saliva:

**1- Protein mucin**.

**2- Ptyalin or α-amylase** for the digestion of starch. Starch is a carbohydrate.

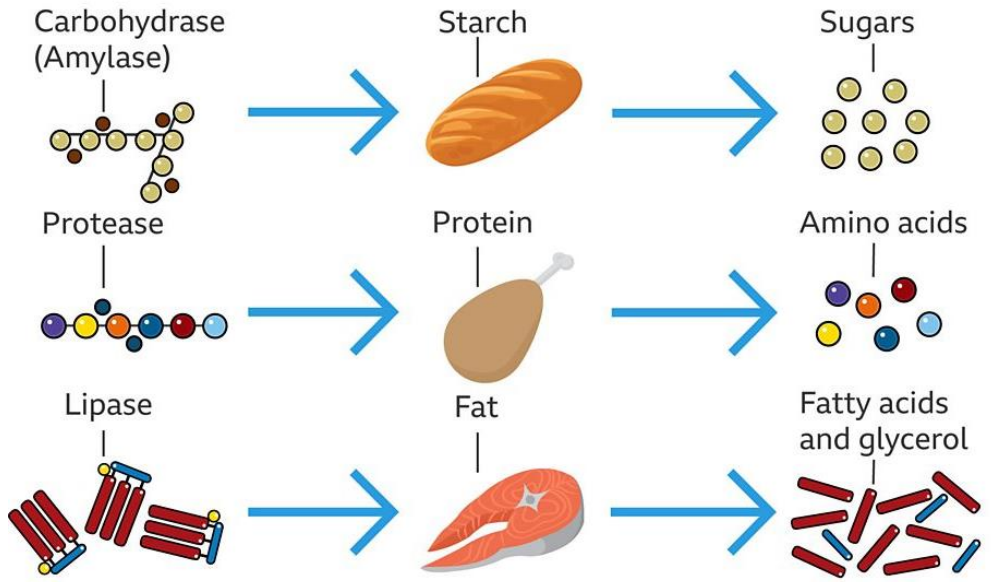
**3- Lingual lipase** It plays an important role in the hydrolysis of triglycerides.

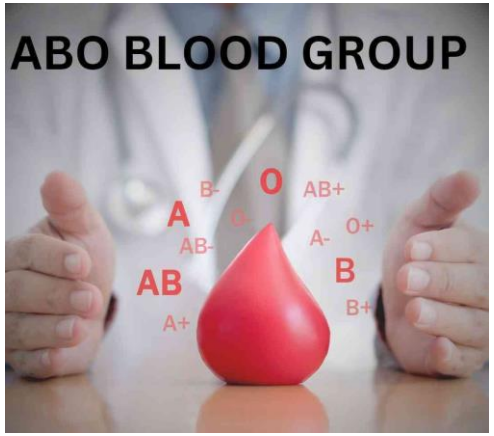
**4- Urea, uric acid & creatinine**.

**5- Kallikrein** which is an enzyme that acts on plasma protein to produce a very powerful vasodilator polypeptide called kinin.

**6- Specific blood group antigen** (ABO system).

**7- Somatostatin, glucagon, renin and several growth factors**.



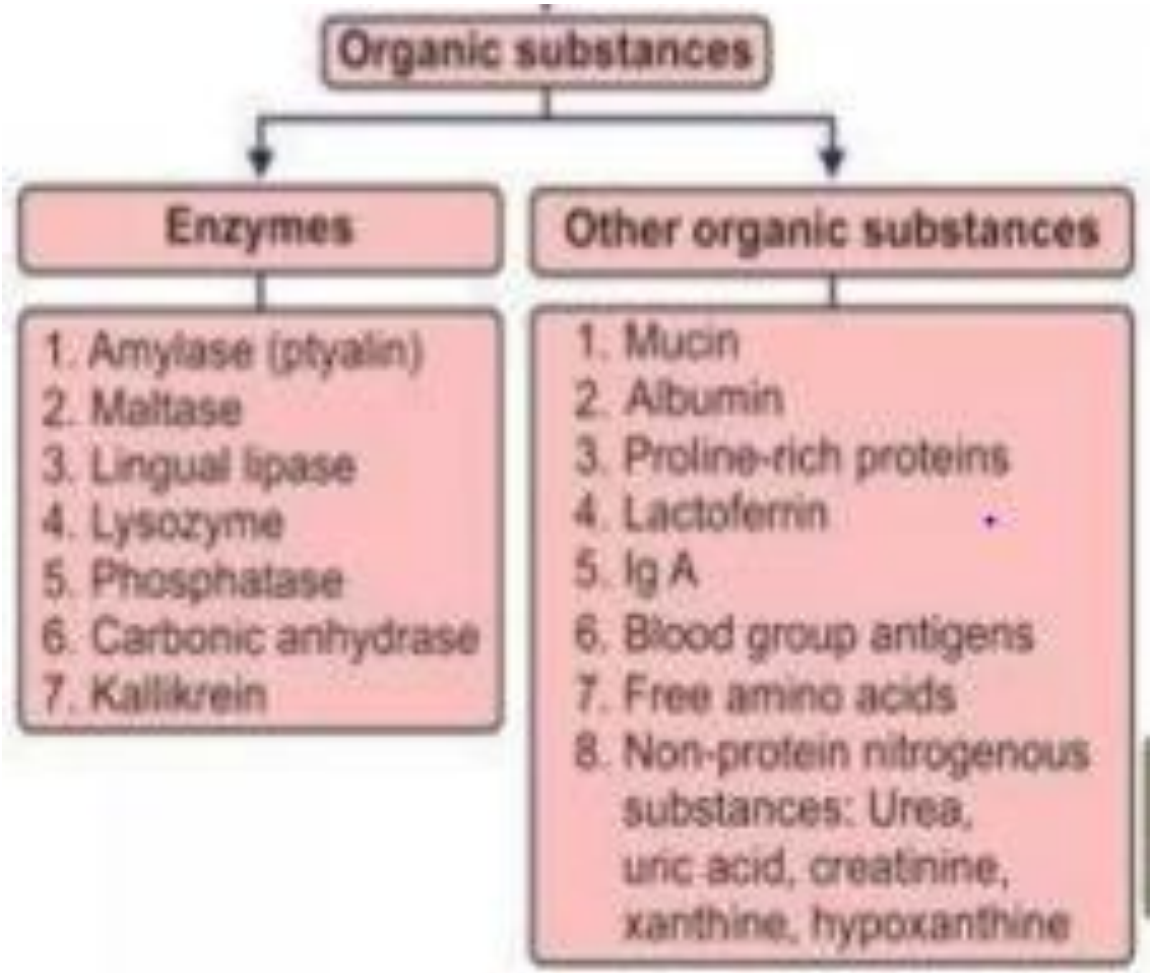
**8- Lysozyme** which can destroy the bacteria by lysis.

**9- Lactoferrin** which binds to iron and deprive organisms of nutrient iron and

is bacteriostatic.

**10- Proline-rich protein** that protects tooth enamel and binds toxic tannins.

**11- Immunoglobulin A ( Secretory Immunoglobulin )** which can destroy the bacteria including those that cause the dental caries.



## Inorganic constituents of saliva ( electrolytes ) :

Saliva contains different

**1- ANIONS** ( -ve Chahrged ) such as chloride **($Cl^-$)** , phosphate **($PO_4^{3-}$)** , bicarbonate **($HCO_3^-$)** , **Floride ($F^-$)** , **Bromide ($Br^-$)** and

**2- CATIONS** ( +ve Chahrged ) such as **calcium ($Ca^{2+}$)** , **sodium ($Na^+$)** and **potassium ($K^+$)**

**Floride** is important to prevent dental caries.

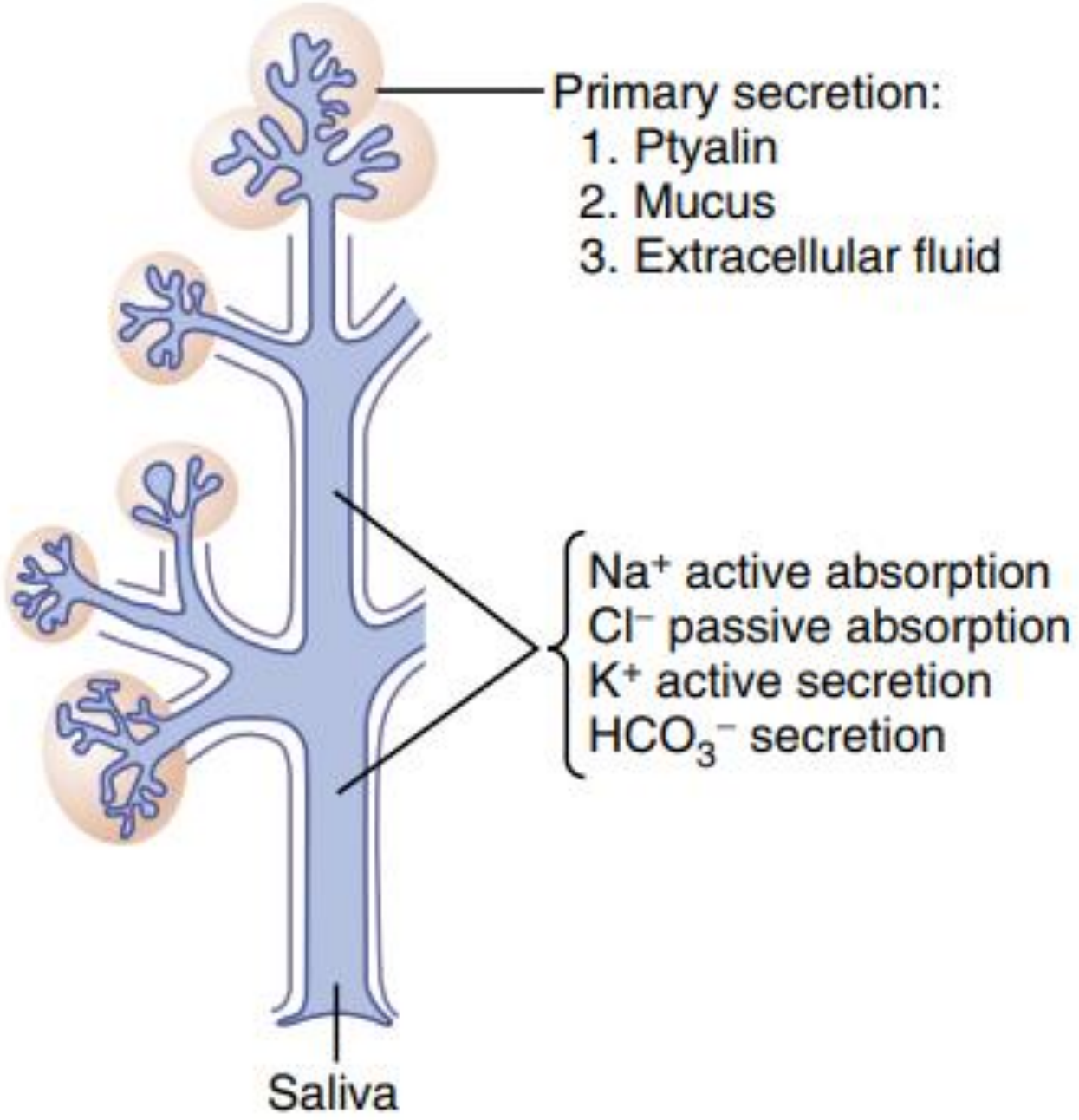
The concentration of **sodium and chloride** in the saliva is less than that in the plasma, while **potassium** concentration in the saliva is higher than that in the plasma.The absorption of sodium and chloride occurs at a faster rate than the secretion of the potassium thus saliva becomes hypotonic.

**The PH of the saliva is between (6 - 7.4).**



**Figure:**

**Formation and secretion of saliva by a submandibular salivary gland.**



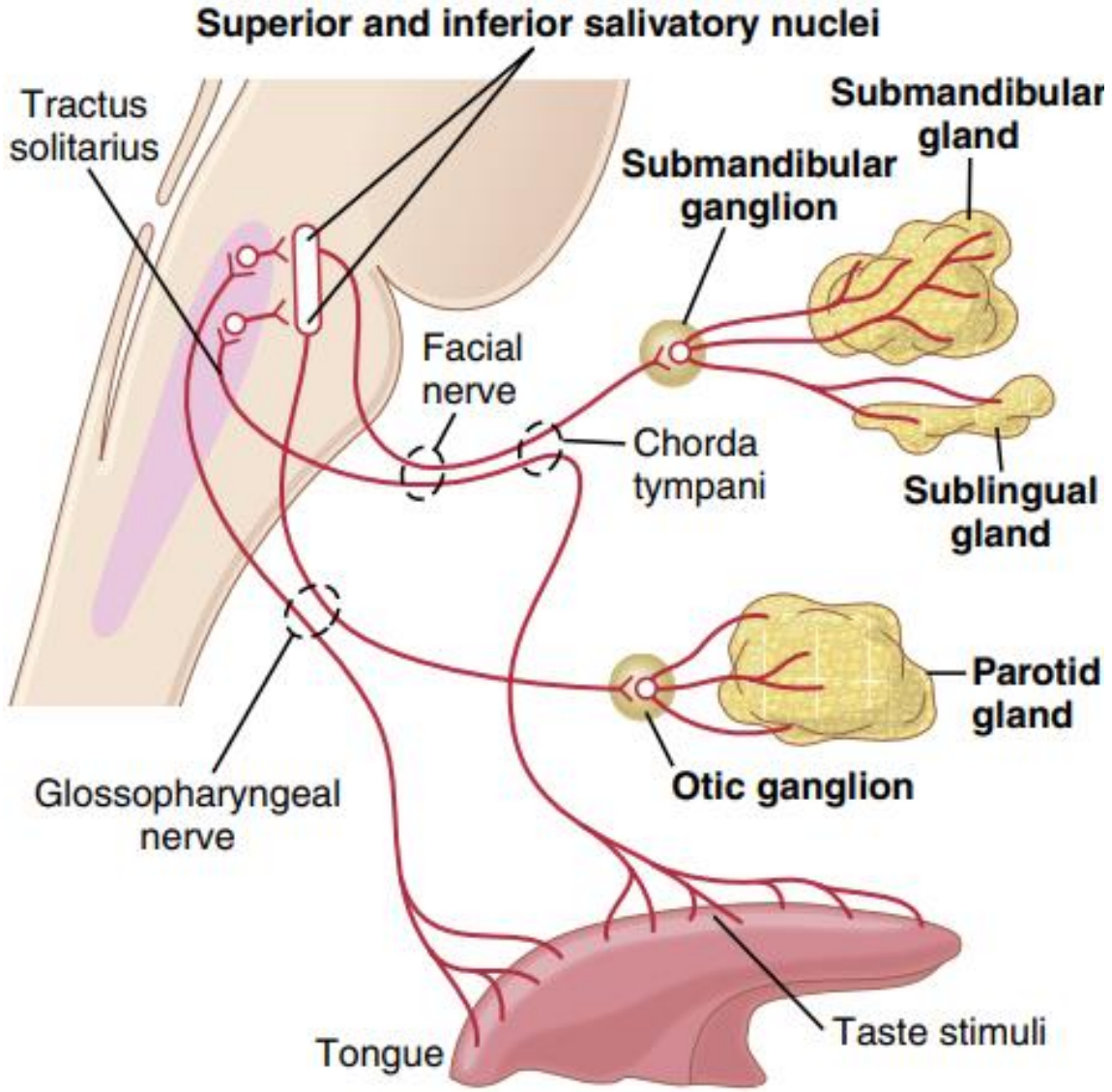
# Regulation of salivary secretion

Salivary secretion is brought about reflexly:

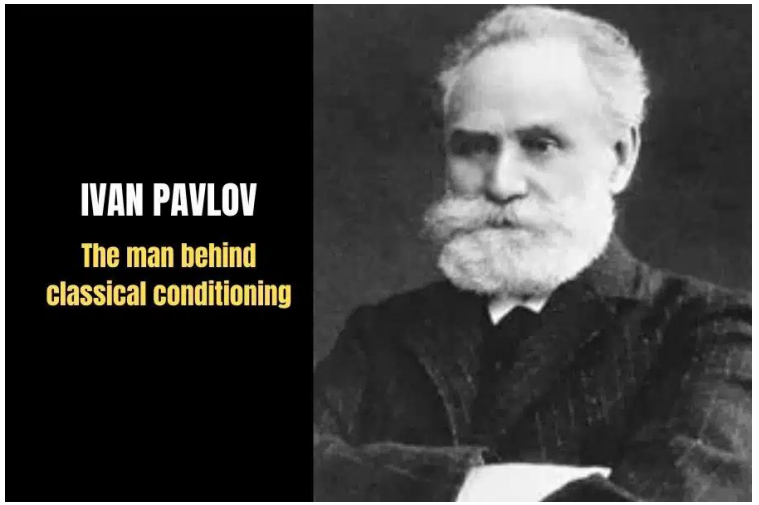
**1-Unconditioned salivary reflex :** Efferent impulses travel along autonomic nerves to salivary glands to stimulate salivary secretion. **It is automatic**, reflexive, and unlearned. **The reflex induce saliva when food in the mouth**. It is due to stimulation of nerve endings in the mucous membrane in oral cavity. Material such as acid will cause profuse salivary secretion because it stimulates the taste buds, this stimulus is chemical in nature.

**Figure** :

**Parasympathetic nervous regulation of salivary secretion →→**



**2- Conditioned reflex** the stimulus is received by one or other of the organs of special senses particularly those of **sight, smell, hearing, or even thought of palatable food**. **It is due to impulses arising from eyes, nose,ears, etc .** Presence of food in the mouth not nessassary to elicit this reflex. The conditioned reflex **requires previous experience** e.g. Pavlov experiment on dogs.




**3- In abnormal situations**, salivation can occur in response to **reflexes originating from the upper gastrointestinal tract ( esophagus, stomach and the small intestine)** by stimulation of the vagal afferent fibers. Therefore when a person eats a very **irritating food** or **is nauseated** there will be an increase salivation which might act as a neutralizing or diluting agent.



# FUNCTIONS OF SALIVA

**1-** facilitates **swallowing :** moisten, lubricate and soften food, mixes it up.

**2-** facilitates **speech** by facilitating movements of the lips and tongue.

**It keeps the mouth wet.**

**3- Important for the taste** sensation because it acts as a solvent. Taste is chemically mediated and therefore any substance must be dissolved in order to stimulate the taste buds.

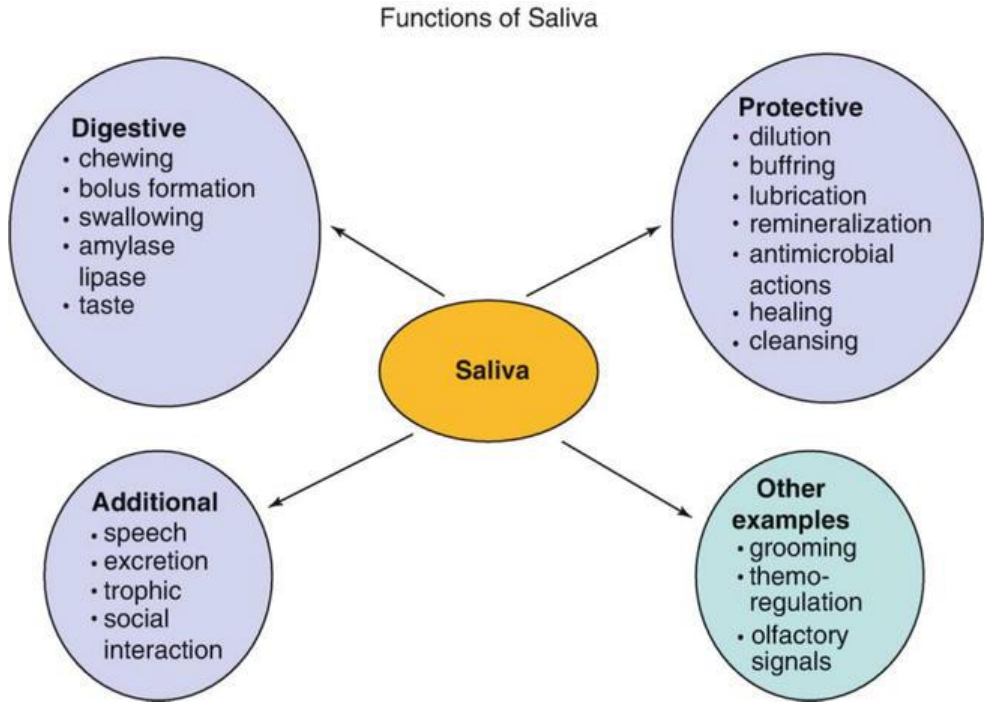
**4- Saliva contains 3 buffering systems** and these are :

① **bicarbonate .**

② **phosphonate.**

③ **mucin**.

The bicarbonate is the most important. These buffers in saliva help in **maintaining the oral PH around 7** so that the teeth do not lose calcium to the oral fluid.

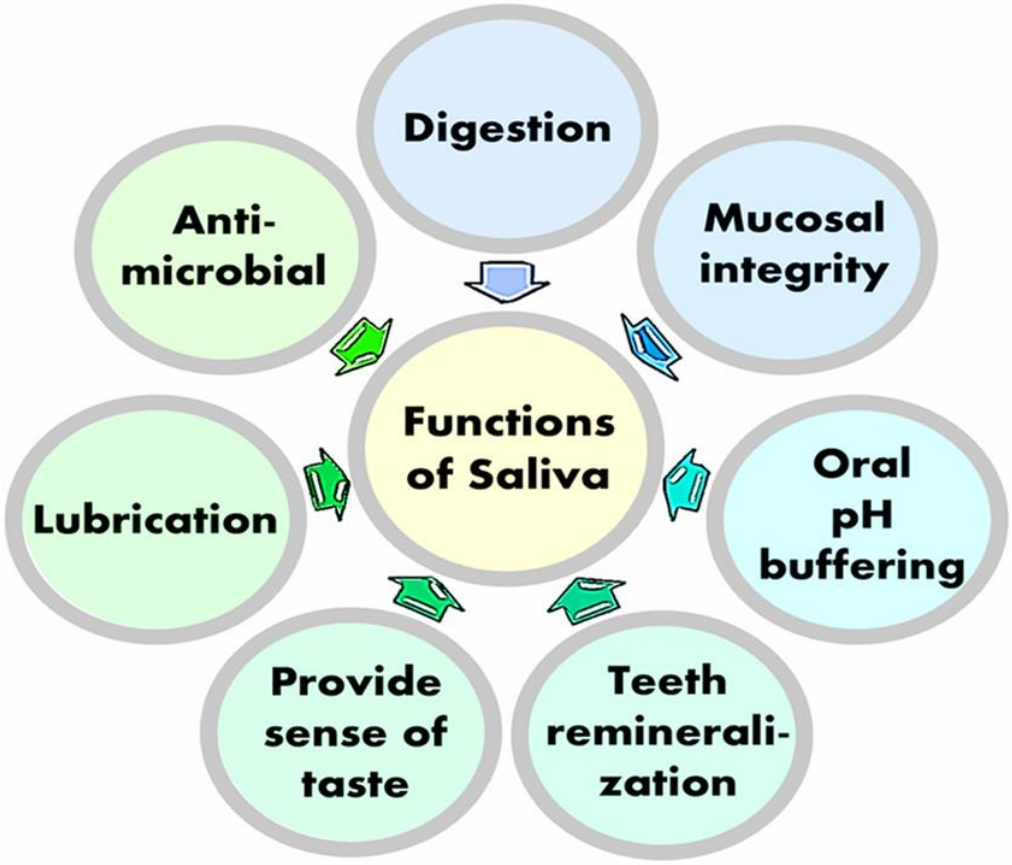


**5- Saliva has a digestive function** : enzyme ptyalin and lingual lipase.

**6- Oral hygiene** : Saliva keeps the mouth and teeth clean. Salivary secretion helps in preventing harmful effects by several ways:

**Mechanical:** the flow of saliva will wash away the pathogenic bacteria and also the remaining food particles and debris that can act as a metabolic support for the bacteria.

**Saliva has antibacterial action**.



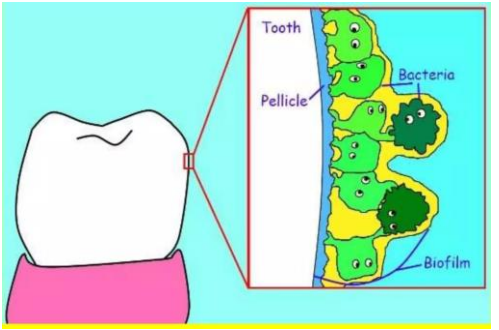
**Thiocyanate ions** which can act as bactericidal.

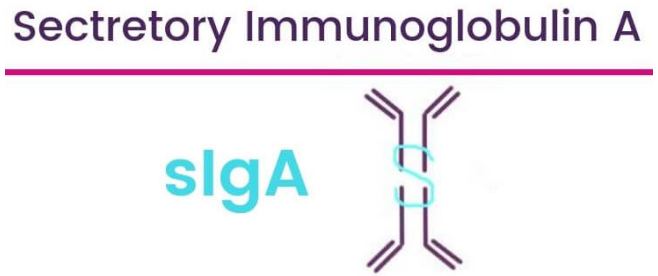
**Lysozyme :** plays role in the innate immunity, providing protection **against bacteria**, **viruses, and fungi**.

**Lactoferrin :** plays role in the innate immunity, providing protection **against bacteria**, **viruses, and fungi**.

**Proline-rich proteins** : important in **maintaining the concentration of ionic calcium in saliva**, bind oral bacteria, and are also able to bind tannins.

**Immunoglobulin A : Secretory IgA** , found in mucous membranes secretion such as saliva, tears, and nasal secretions. Protect from microbial invasion and maintain immune homeostasis.



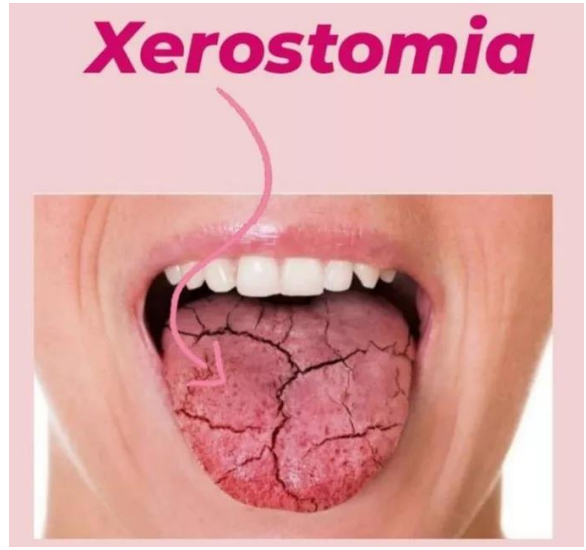



# Disturbance of salivary secretion:

## Deficiency of salivary secretion (xerostomia)

can occur after

- **Emotional state such as fear or anxiety.**
- **Dehydration.**
- **Fever.**
- **Anticholinergic drugs.**
- **Sjogren's Syndrome**





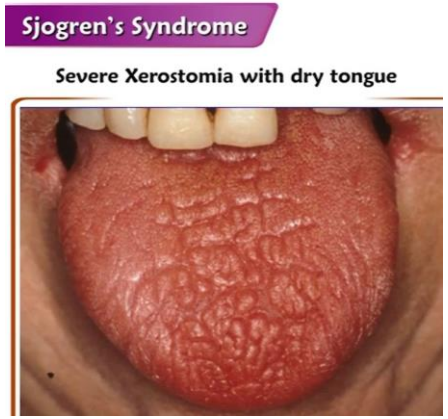










**Hyper salivation (sialorhoea)** occurs during:

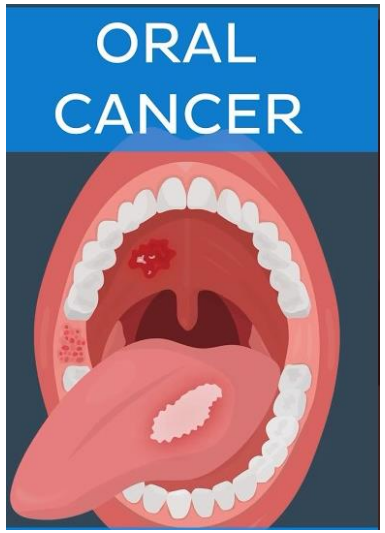
**- Pregnancy.**

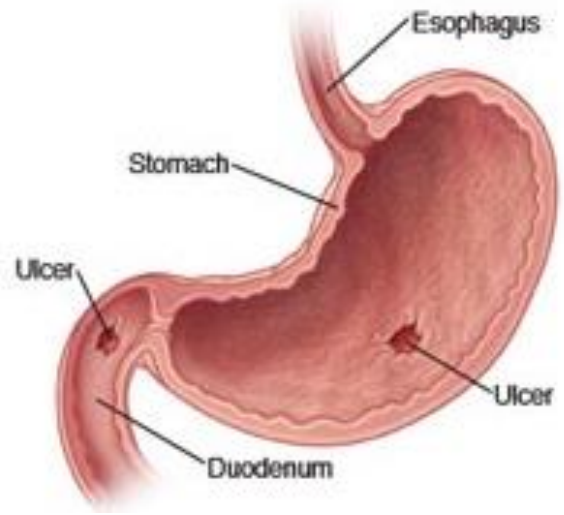
**- Tumors** of the mouth or tongue or even a carious tooth (reflex stimulation of salivary secretion due to local irritation).

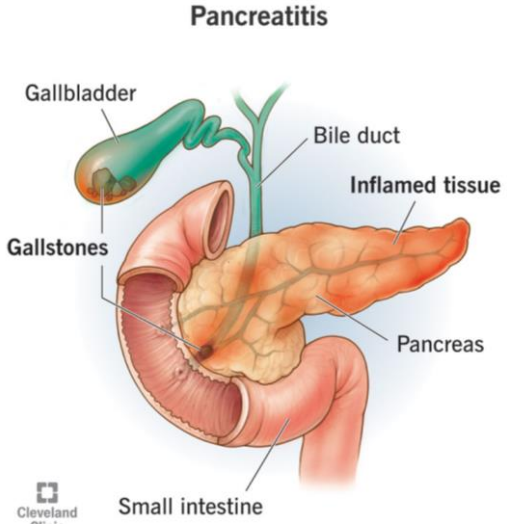
**- Diseases of the esophagus, stomach, pancreas** such as tumor of the esophagus or spasm, gastric or duodenal ulcer, pancreatitis, (esophago-salivary reflex).





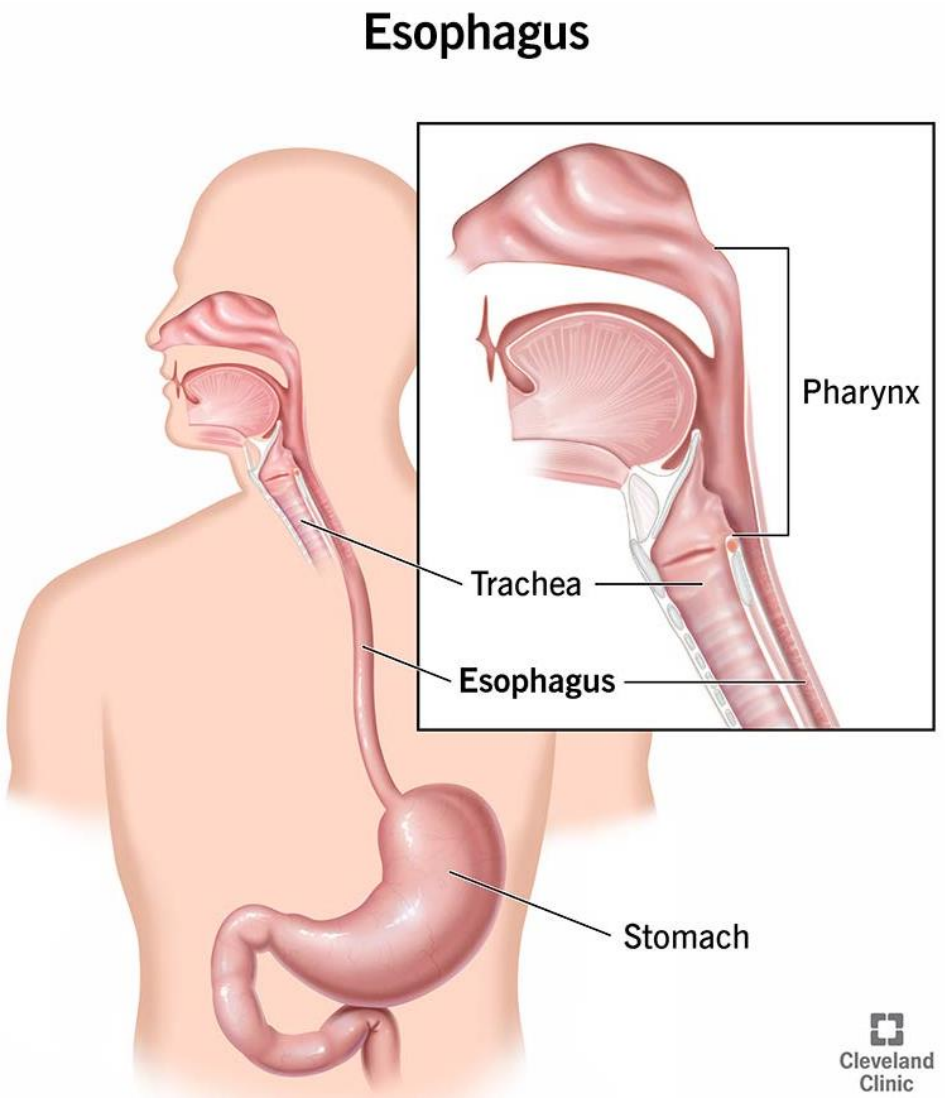



# Esophageal secretion:

- Esophageal secretions are entirely **mucous** and mainly provide lubrication for swallowing.
- The **mucus** secreted by the compound glands in the
- **1-upper esophagus prevents mucosal excoriation** by newly entering food, whereas the compound glands located **2-near the esophago - gastric junction protect the esophageal wall from digestion by acidic gastric juices** that often reflux from the stomach back into the lower esophagus.



# FUNCTIONS OF THE STOMACH

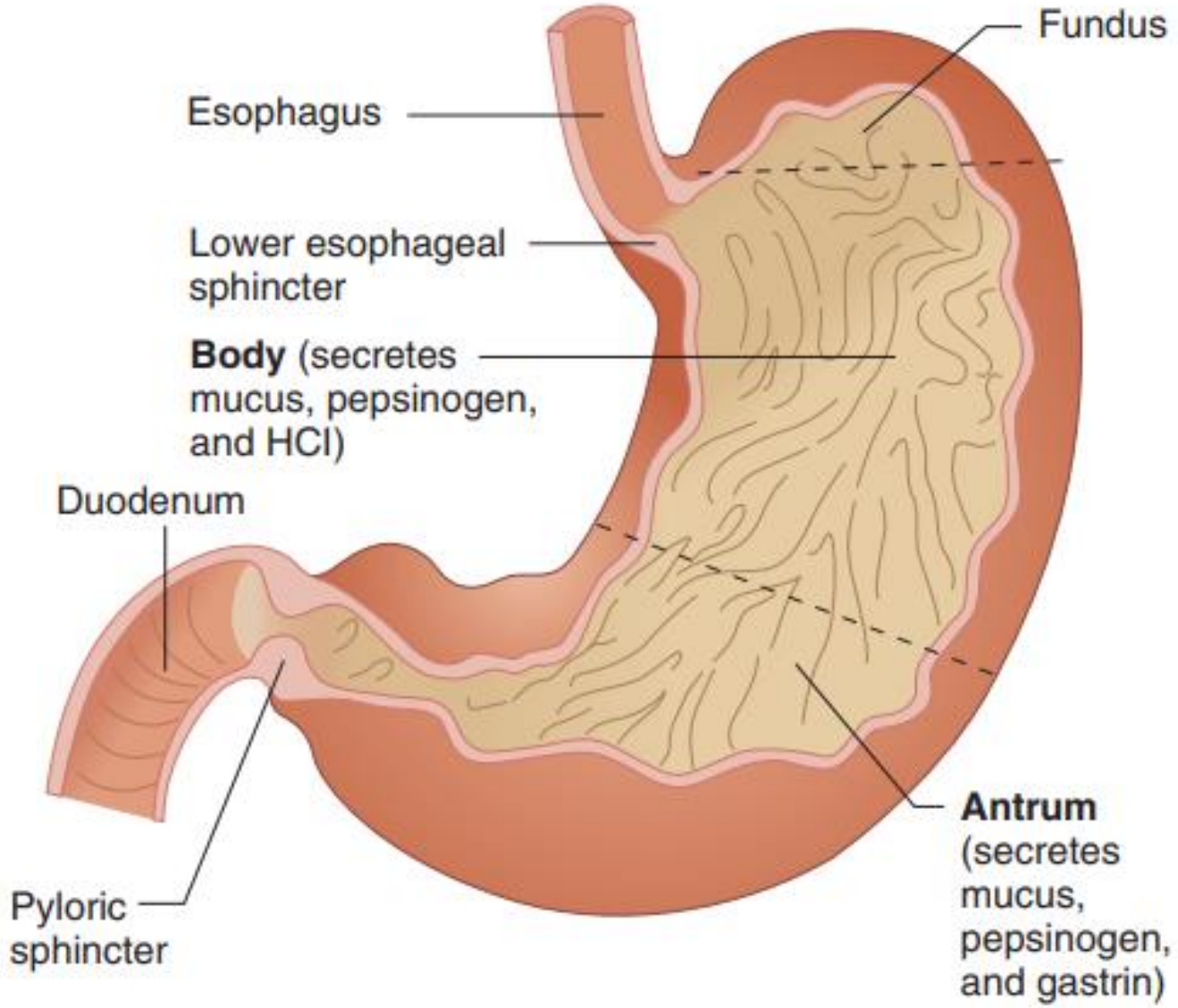



**Figure:**

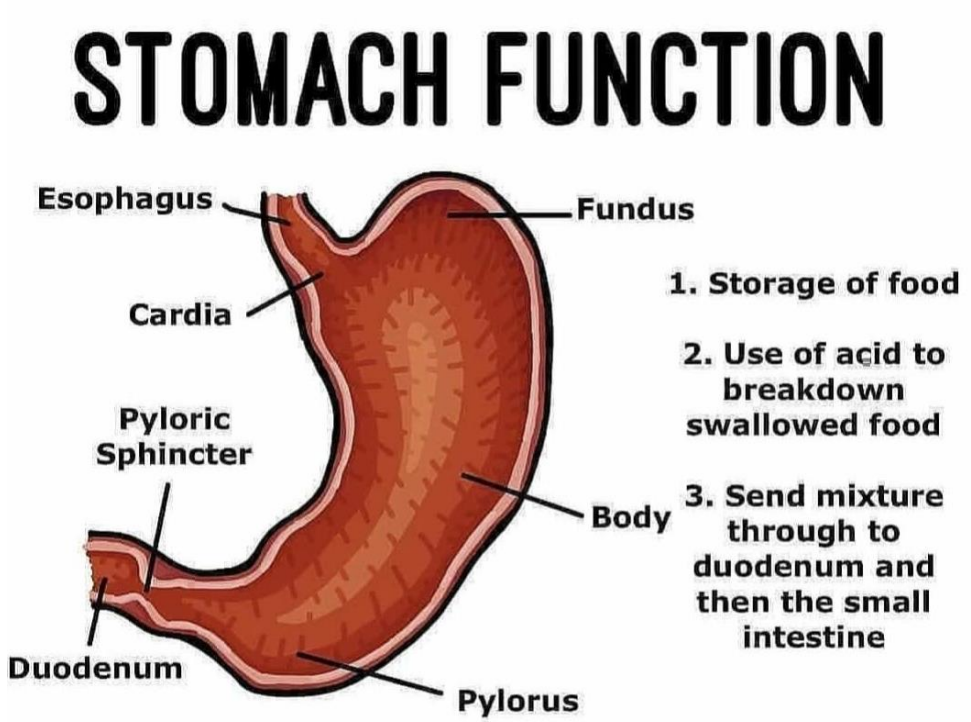
**Physiological anatomy of the stomach.**

# FUNCTIONS OF THE STOMACH

**1- As a reservoir to store the food**, we can eat food faster than we can digest.

**2- Mechanical degradation and liquification of the food**, the stomach mixes the food with gastric secretion until it forms a **semi-fluid mixture called chyme**.

**3- Digestive function ( Partial )** by hydrochloric acid and pepsin. Hydrochloric acid cause hydrolysis of food and also activates pepsinogen into pepsin and pepsin begins protein digestion.



**4- Antibacterial action**, the high acidity of the gastric juice will render the gastric juice sterile.

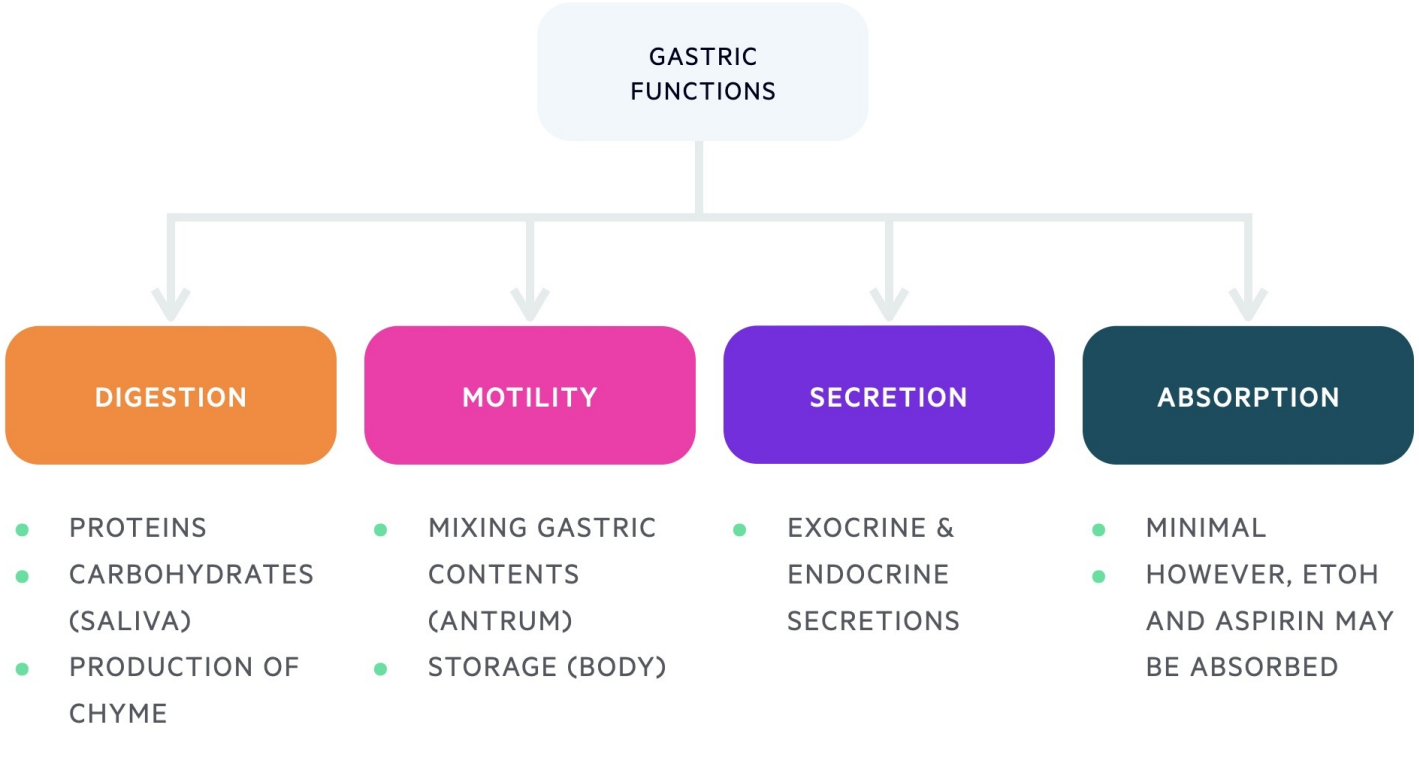



**5- Absorption**, no nutritionally important absorption occurs in the stomach , some water and lipid soluble drugs are absorbed across the stomach mucosa.

**6- Haemopoiesis**, the **secretion of intrinsic factor** in the body of the stomach is necessary for the normal **absorption of vitamin B12** in ileum.




**Gastric secretion** adds **about 2.5 L/day.**



# Glands of the Stomach

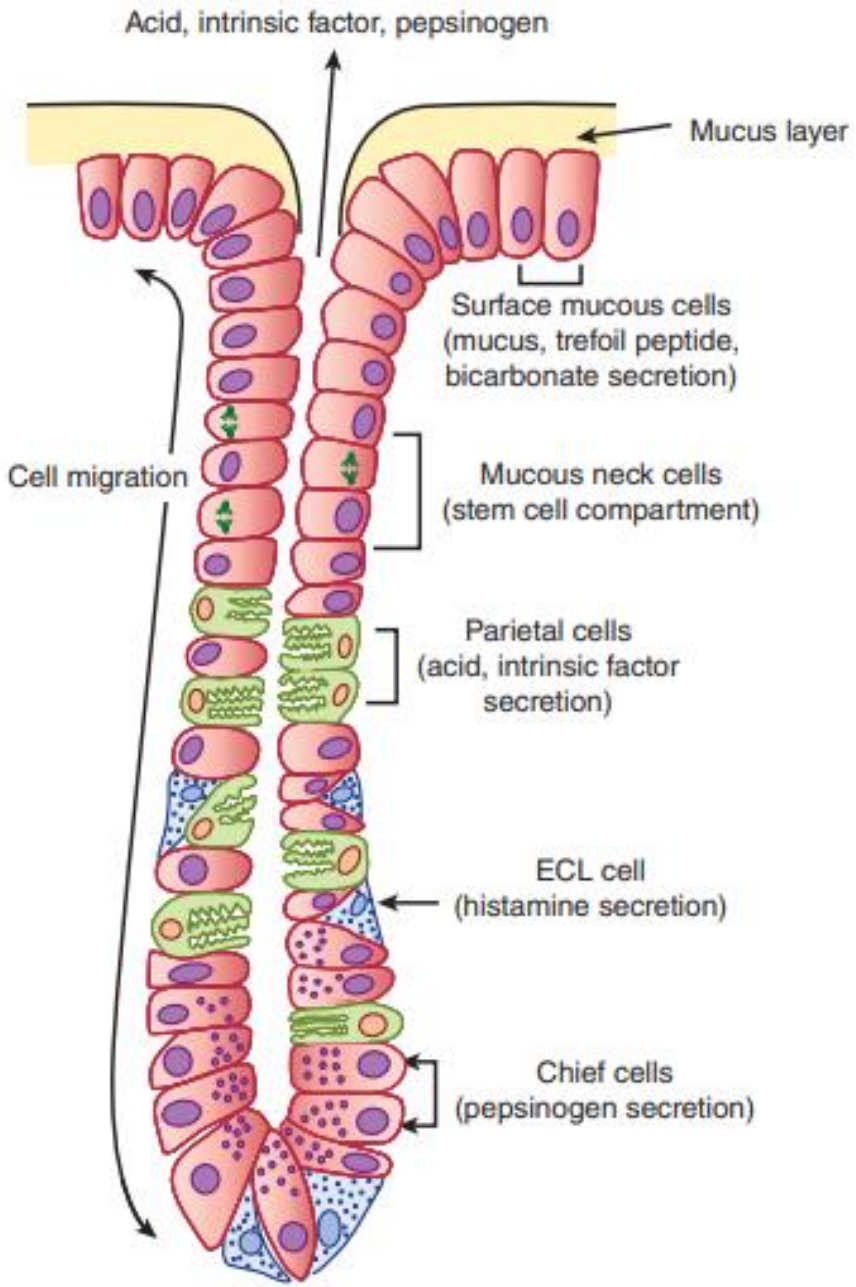
**1- Mucus neck cells**: these cells secret mainly **mucus** with some pepsinogen.They divide and the new cells which migrate both to the surface to become mucus cells or down into the gland to become parietal cells. Peptic cells are capable of mitosis but they may also come from mucus neck cells.

**2- Peptic or chief cells**: these cells secrets **pepsinogen**.

**3- Parietal or oxyntic cells**: these cells secrete **hydrochloric acid (HCL)** and also **the intrinsic factor**.

**FIGURE** →

**Structure of a gastric gland from the fundus or body of the stomach**



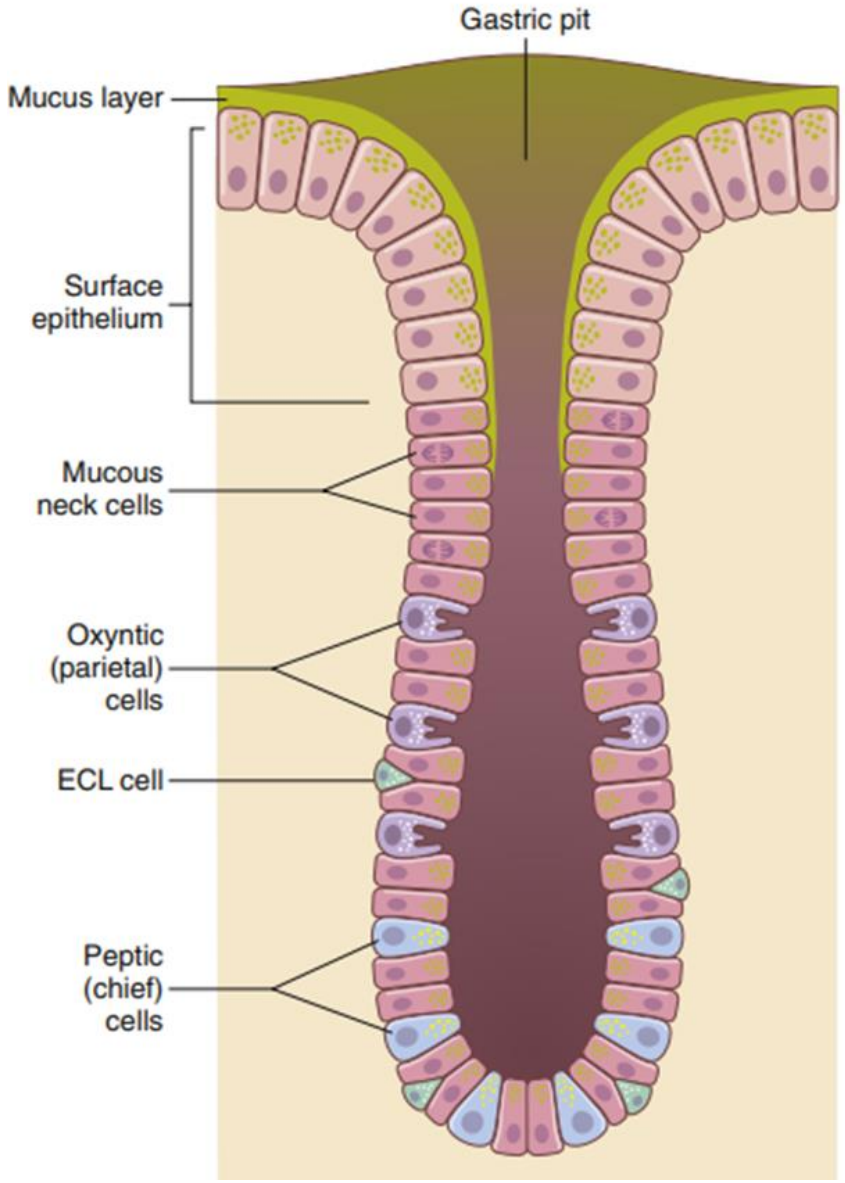



**Figure** :

**Gastric (oxyntic) gland from the body of the stomach. ECL, Enterochromaffin-like cells**

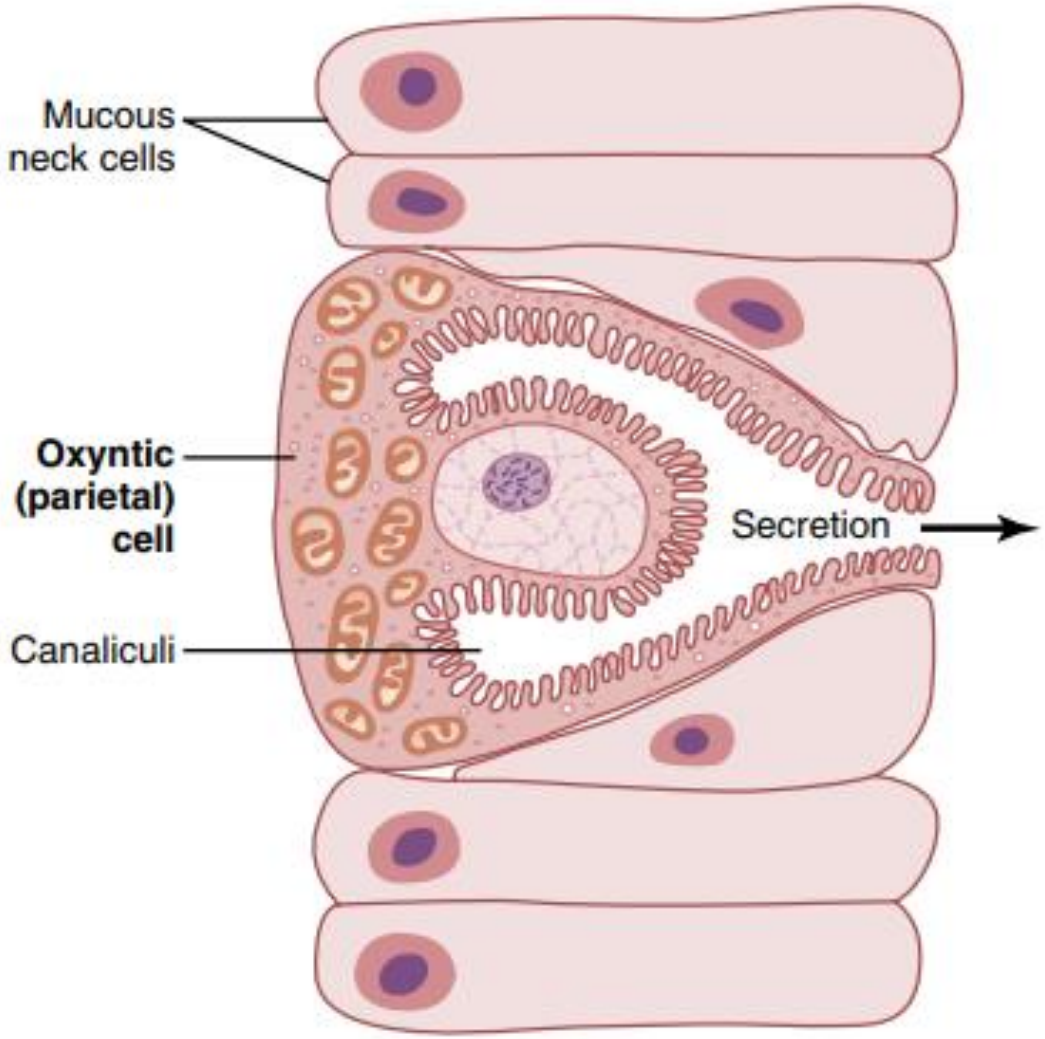



**Figure:**
**Schematic anatomy of the canaliculi in a parietal (oxyntic) cell.**


Thank you!