ORAL PHYSIOLOGY

COURSE CODE: 1605204

2 credit Units

SALIVARY SECRETION

Part 1

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Week 3, Lecture 2

Intended Learning Outcomes

1- To overview on Salivary glands

2- To understand the Properties and composition of saliva

3- To identify the Functions of saliva

4- To understand mechanism of salivary secretion

Functions of mouth

The primary function of mouth is eating. It has few other important functions also. The functions of the mouth are:

1- Ingestion of food materials.

2- Chewing the food and mixing it with saliva.

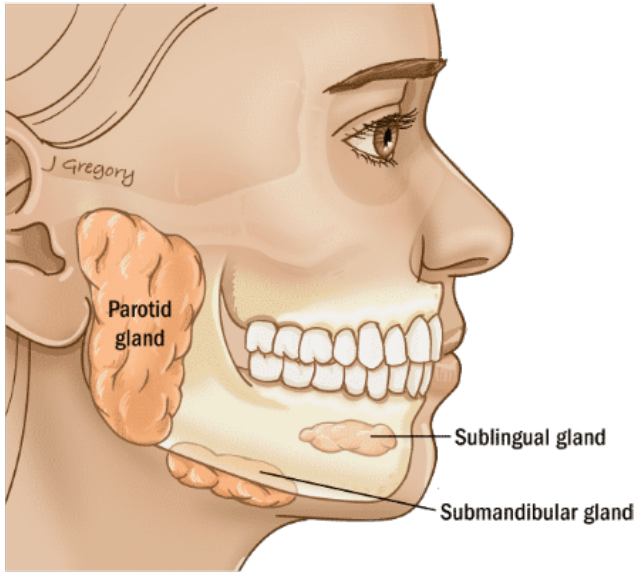
3- Appreciation of the taste.

4- Transfer of food (bolus) to the esophagus by swallowing.

5- Role in speech.

6- Social functions such as smiling and other expressions.

Salivary glands



A- Major glands are:

· Are they exocrine or endocrine gland? Exocrine gland (duct بتصب في الـ)

1- Parotid glands. (2)

2- Submaxillary or submandibular glands. (2)

3- Sublingual glands. (2)

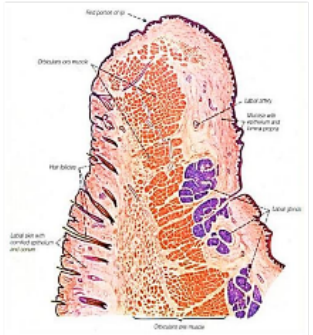
B- Minor salivary glands are:

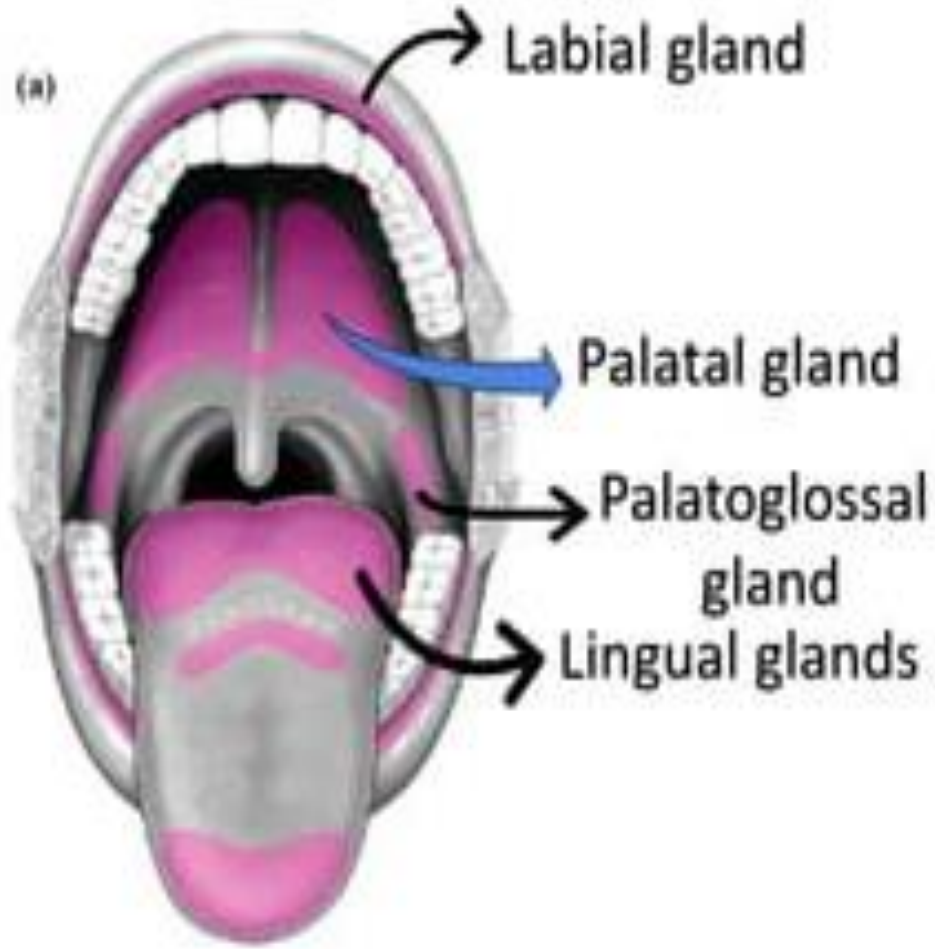
Number: 600 – 1000 / Present in areas where there's submucosa

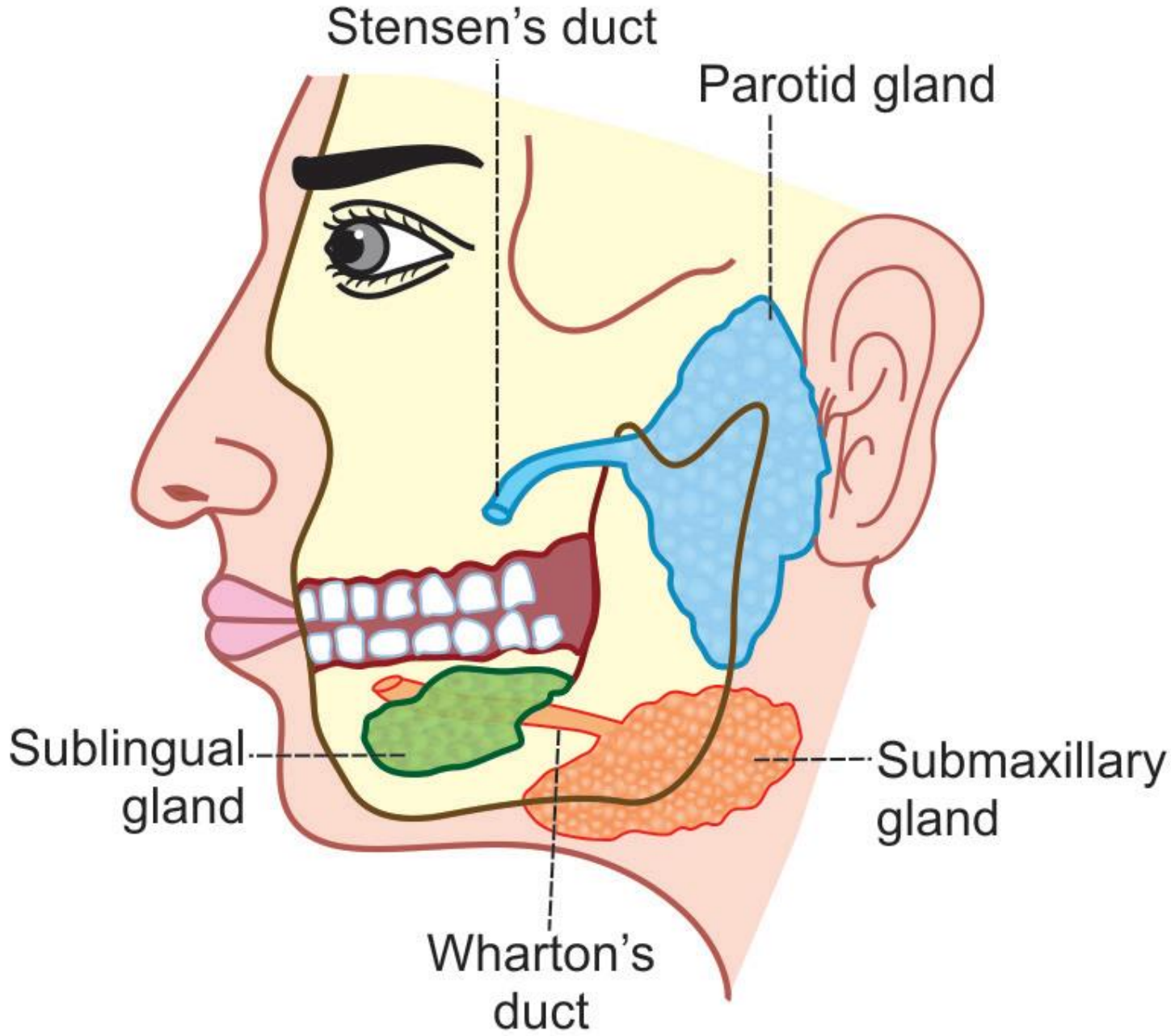
1- Lingual mucous glands situated in posterior 1/3 of the tongue.

2- Labial glands situated beneath the mucous membrane around the orifice of mouth.

3- Palatal glands found beneath the mucous membrane of the soft palate. (The hard palate doesn't contain submucosa)




(a)
Labial gland
Palatal gland
Palatoglossal gland
Lingual glands


Stensen's duct
Parotid gland
Sublingual gland
Submaxillary gland
Wharton's duct

Salivary glands are classified into three types based on the type of secretion.

1. **Serous Glands** Main component: α-amylase

   This type of gland is predominately made up of serous cells. These glands secrete thin and watery saliva. Parotid glands and lingual (serous) glands are the serous glands.

1. **Mucous Glands**

   This type of gland is made up of mainly the mucous cells. These glands secrete thick, viscus saliva with high mucin content. (Responsible for the high viscousity) Lingual mucous glands, buccal glands and palatal glands belong to this type.

1. **Mixed Glands**

   Mixed glands are made up of both serous and mucus cells. Submandibular, sublingual and labial glands are the mixed glands.

* Which glands secrete pure serous secretions? Parotid glands + Lingual serous glands

Properties of Saliva

1- Volume: 1,000 to 1,500 mL of saliva is secreted per day and it is approximately about 1 mL/min. Contribution by each major salivary gland is:

I) Parotid glands: 25%

II) Submaxillary glands: 70%

III) Sublingual glands: 5%

·Minor salivary glands: 1-2% of the whole salivary secretion

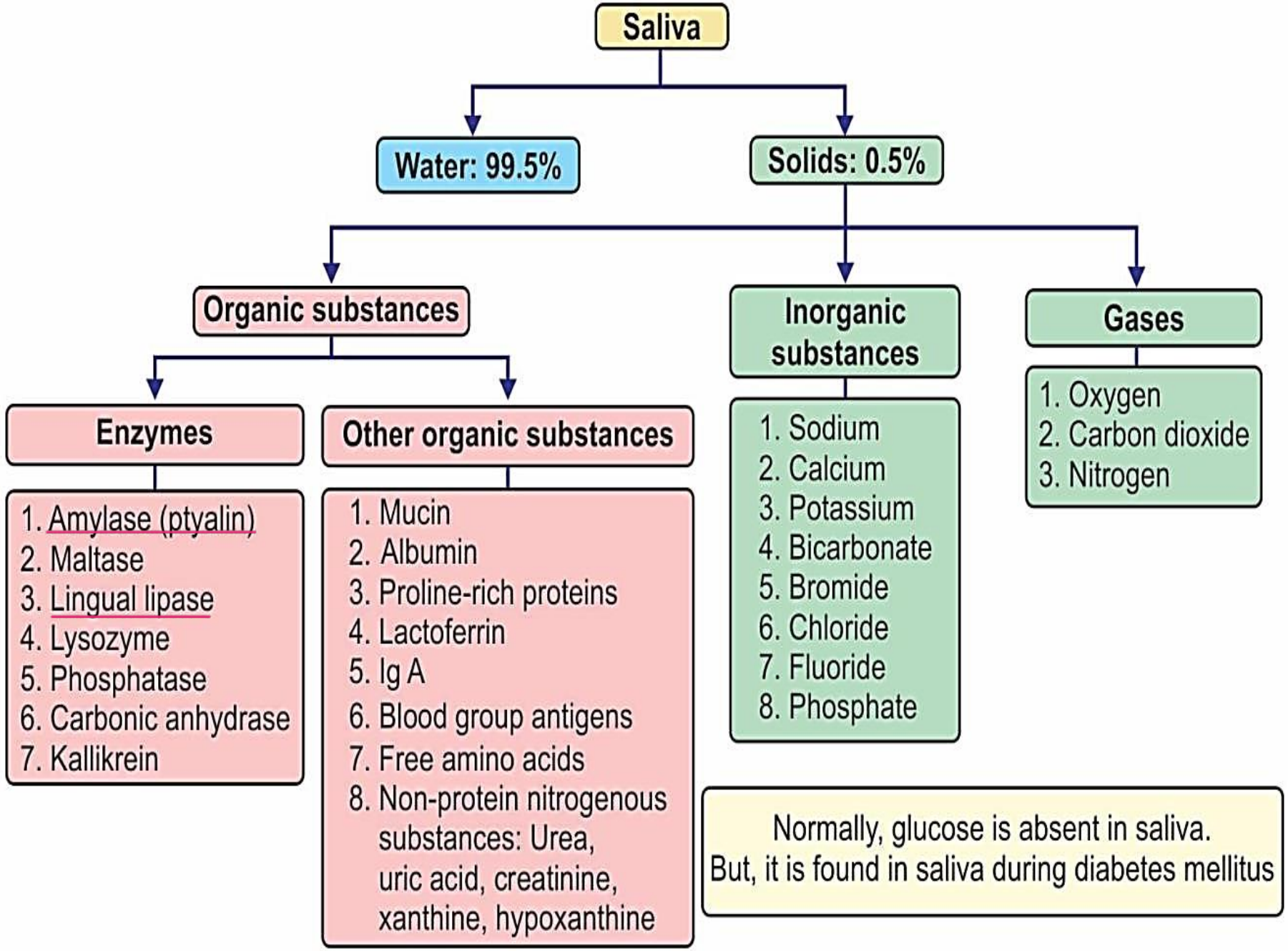
2- Reaction: Mixed saliva from all the glands is slightly acidic with pH of 6.35 to 6.85.

3- Specific gravity: It ranges between 1.002 and 1.012.

4- Tonicity: Saliva is hypotonic to plasma.

Composition of Saliva

Mixed saliva contains 99.5% water and 0.5% solids.



Functions of saliva

1.Preparation of food for swallowing

-When food is taken into the mouth, it is moistened and dissolved by saliva. The mucous membrane of mouth is also moistened by saliva. It facilitates chewing. The mucin of saliva lubricates the bolus and facilitates the swallowing.

2. Appreciation of taste

-Taste is a chemical sensation. Saliva, by its solvent action, dissolves the solid food substances, so that the dissolved substances can stimulate the taste buds to recognize the taste.

3.Digestive function

The saliva has three digestive enzymes namely, salivary amylase, maltase and lingual lipase.

(α-amylase) (Ptyalin)

- *Salivary Amylase:* Salivary amylase is a carbohydrate digesting enzyme. It acts on cooked or boiled starch and converts it into dextrin and maltose. The starch digestion starts in the mouth, major part of it occurs in the stomach, because food stays only for a short time in the mouth.
- *Lingual Lipase:* Lingual lipase is a lipid digesting enzyme. It digests milk fats (pre-emulsified fats). It hydrolyzes triglycerides into fatty acids and diacylglycerol.

4.Cleansing and protective functions

1) Saliva prevents bacterial growth by removing materials, which may serve as culture media for the bacterial growth.

2) During hyposalivation, the bacterial growth is accelerated, and the common consequence is dental caries.

3) Saliva also contains secretory immunoglobulin IgA which has antibacterial and antiviral actions.

4) Mucin present in the saliva protects the mouth by lubricating the mucous membrane of the mouth.

5.Role in speech

- By moistening and lubricating soft parts of mouth and lips, saliva helps in speech. If the mouth becomes dry, articulation and pronunciation become difficult.

6.Excretory function

- Many substances, both organic and inorganic, are excreted in saliva. It excretes substances like mercury, potassium iodide, lead and thiocyanate. Saliva also excretes some viruses such as those causing rabies and mumps.

In some pathological conditions, saliva excretes certain substances, which are not found in saliva under normal conditions such as glucose in diabetes mellitus.

7. Regulation of body temperature

- In dogs and cattle, excessive dripping of saliva during panting helps in loss of heat and regulation of body temperature. However, in human being, sweat glands play major role in temperature regulation and saliva does not play any role in this function.

8. Regulation of water balance

- When the body water content decreases, salivary secretion also decreases. This causes dryness of the mouth and induces thirst. When the water is taken, it quenches the thirst and restores the body water content.

Function of Saliva for Oral Hygiene.

Under basal awake conditions, about 0.5 milliliter of saliva, almost entirely of the mucous type, is secreted each minute; **However, during sleep**, little secretion occurs. This secretion plays an exceedingly important role for maintaining healthy oral tissues. The mouth is loaded with pathogenic bacteria that can easily destroy tissues and cause dental caries. Saliva helps prevent the deteriorative processes in several ways:

1. The flow of saliva helps wash away pathogenic bacteria.

2. Saliva contains several factors that destroy bacteria. One of these is **thiocyanate ions** and another is several proteolytic enzymes—most important, lysozyme that:

(a) Attack the bacteria

(b) **Digest food particles**.

3. Saliva often contains significant amounts of antibodies that can destroy oral bacteria

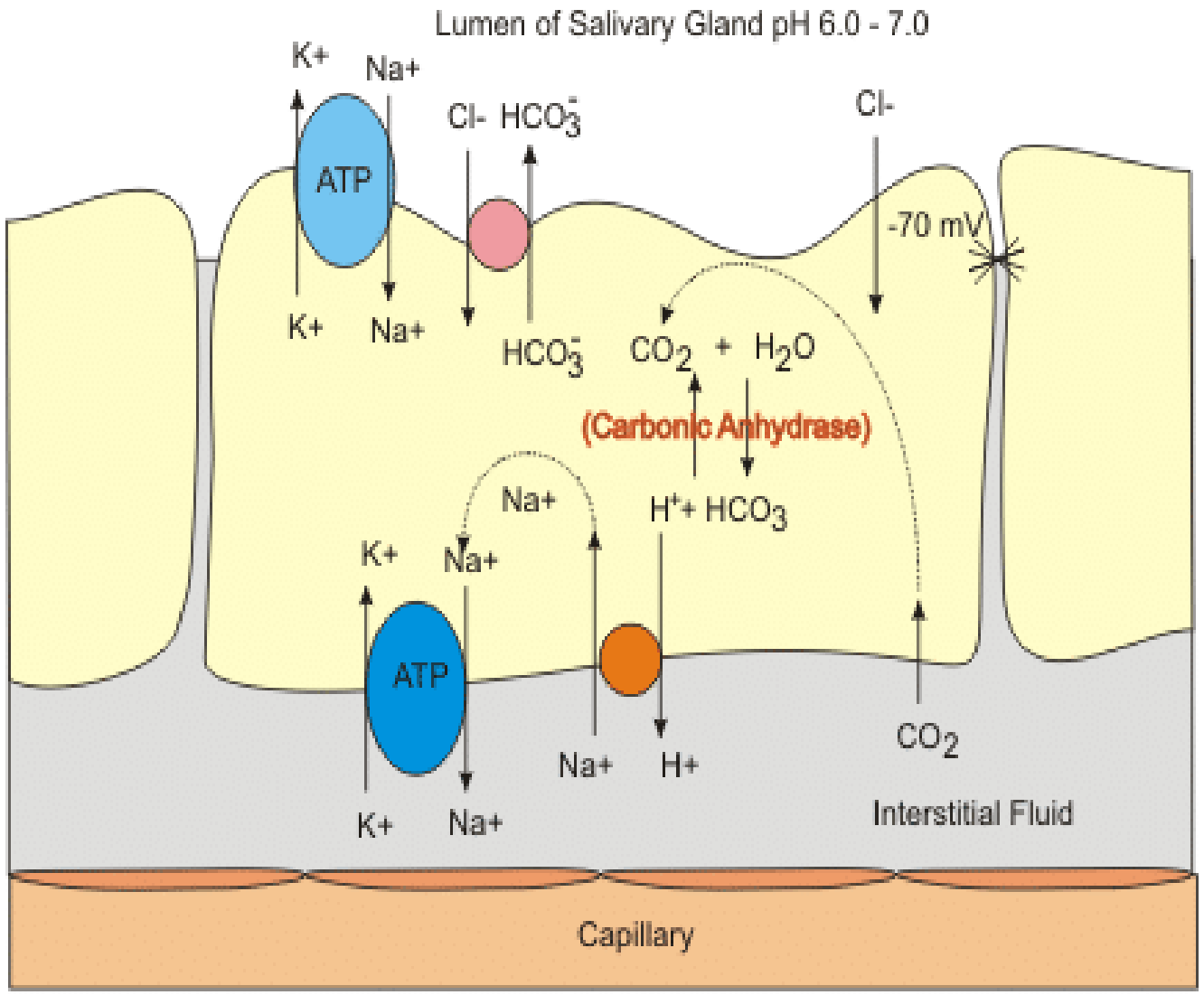
In the absence of salivation, oral tissues often become ulcerated and otherwise infected, and caries of the teeth can become rampant.

Mechanism of salivary secretion

Primary saliva is produced in acinar cells is isotonic and has a composition similar to plasma. Primary saliva is modified in the excretory ducts, forming secondary saliva. As saliva passes through the striated and excretory ducts, Na^+ and Cl^- are reabsorbed, and K^+ and HCO_3^- are secreted into the lumen. The saliva becomes hypotonic as Na^+ and Cl^- reabsorption is greater than K^+ and HCO_3^- secretion, and the ducts are relatively impermeable to water. At high flow rates, this modification process lags, and the composition of secondary saliva becomes similar to that of primary saliva.

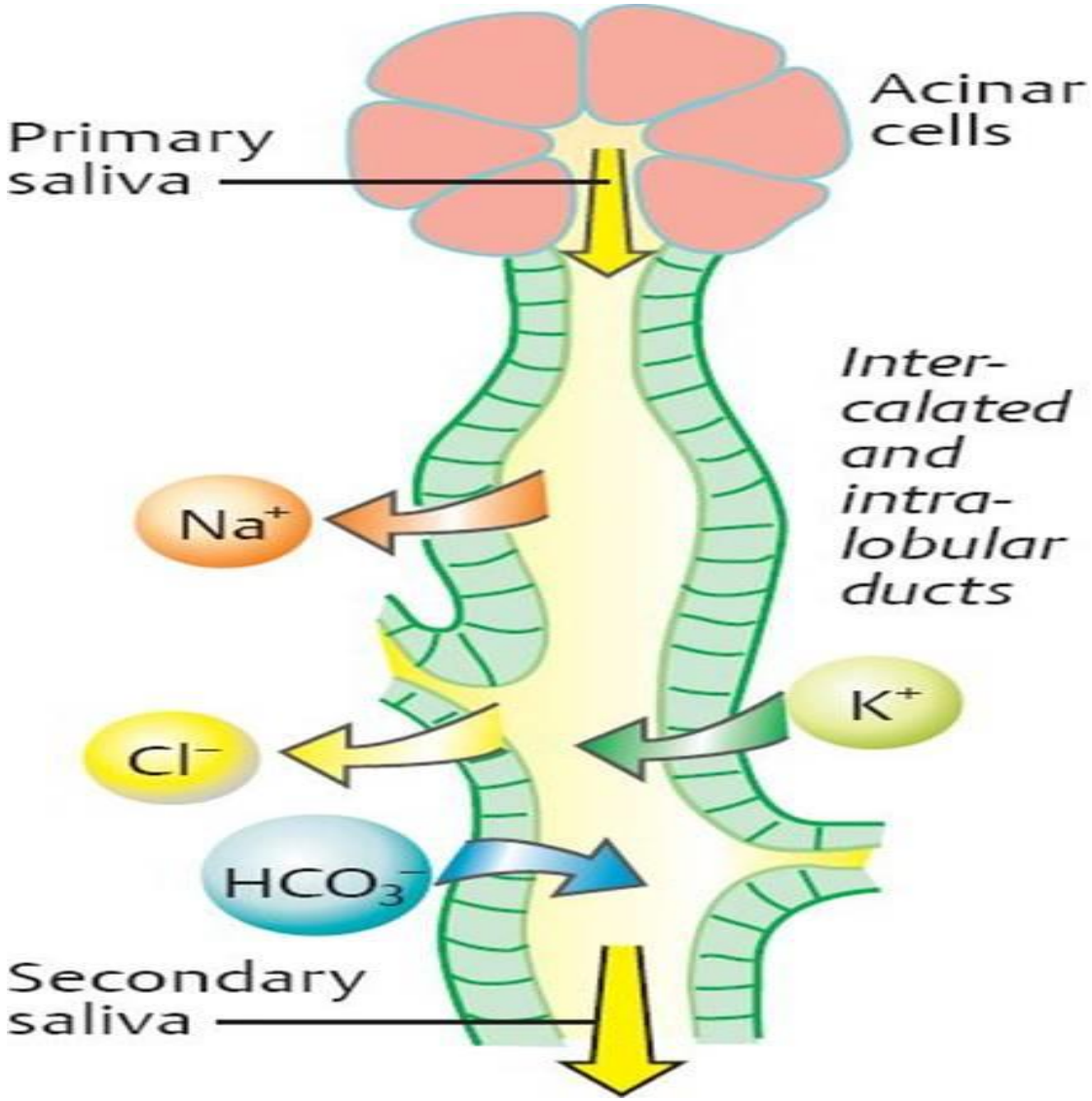
N.B: the striated ducts perform the major role In saliva modification

Mechanism of salivary secretion



Exchange of Potassium and Sodium in Salivary Ducts

Frank Boumphrey M.D.
2009



Useful links

https://www.youtube.com/watch?v=eWJkETu6GbU

https://www.youtube.com/watch?v=i5OOVXl0yAI

https://www.youtube.com/watch?v=i6muLXJDXoE