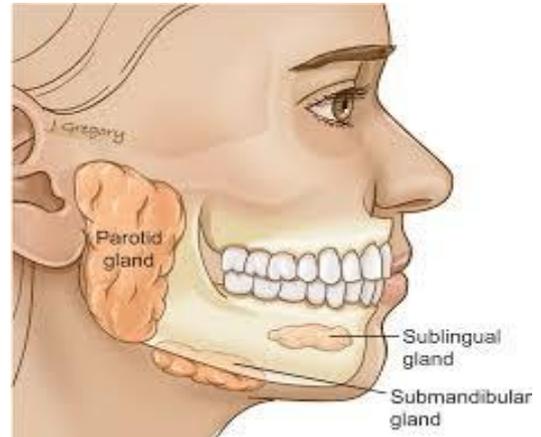


## Distinguishing histologic characteristics of salivary glands

### ✓ (Types of salivary glands):

#### {A} Major salivary glands:

- They are located extraorally خارج الفم and their secretions reach the mouth by variable ducts.



|             | <u>Parotid gland</u>   | <u>Submandibular gland</u>  | <u>Sublingual gland</u>   |
|-------------|--|---|---|
| <b>Site</b> | <p>-it has 2 parts.</p> <p>-the <b>superficial portion</b> is located in front of the external ear.</p> <p>-the <b>deeper portion</b> fills the retromandibular region.</p> <p>يعني ورا ال mandible من جوة</p> | <p>-located in the submandibular triangle behind and below the free border of mylohyoid muscle with a small tongue like extension lying above the mylohyoid muscle.</p> <p>موجودة تحت عضلة ال mylohyoid وبتلف عليها</p> | <p>-Composed of on main(major) gland and several smaller (minor) glands.</p> <p>-lie between the floor of the mouth and mylohyoid muscle.</p> |
| <b>Type</b> | <p>-<b>in infants:</b> mixed but predominantly serous.</p> <p>- <b>in adult:</b> pure serous.</p>  | <p>-mixed gland but predominantly serous.</p> <p>-serous demilunes are evident .</p>  | <p>-<b>the major gland:</b> Mixed but predominantly mucous.</p> <p>-<b>the minor glands:</b></p>  |

## Helper\_team

|                            |   |  |  |
|----------------------------|---|--|--|
|                            | -in old age: mixed predominantly serous   |  | Pure mucous  |
| <b>Development</b>         | Starts by the 4 <sup>th</sup> to 6 <sup>th</sup> week I.U ( داخل الرحم)   | Starts by the 6 <sup>th</sup> to 7 <sup>th</sup> week I.U  | Start developing at 8 <sup>th</sup> to 12 <sup>th</sup> week I.U   |
| <b>Secretion of saliva</b> | 25-30% per day  | -The majority of saliva is secreted by submandibular gland<br>-60% per day   | 5% per day   |
| <b>Main excretory duct</b> | <p style="color: green;"><b>Stensons duct</b></p> <p>-it opens into the oral cavity on the buccal mucosa opposite to upper 2<sup>nd</sup> molar which is marked by small papilla.</p> | <p style="color: green;"><b>Whartons duct</b></p> <p>-opens at the summit of a small papilla at the side of the lingual frenum of the mouth.</p> <p style="text-align: center;">القناة دي بتفتح تحت اللسان في ال<br/>side of ال papilla<br/>lingual frenum</p> <p>-lingual frenum: الغشاء اللي بيربط اللسان من تحت بارضية الفم</p> | <p style="color: green;"><b>Bartholins duct</b></p> <p><b>-the major gland:</b><br/>Opens with or near the submandibular duct ( at the side of lingual frenum)</p> <p><b>-the minor glands:</b><br/>Open along the sublingual fold through several small ducts from 8-20 in number. (these small ducts are called <b>Rivinus</b>)</p> <p style="text-align: right;">الغدد الصغيرة بتفتح بقنوات صغيرة اسمها rivinus</p> |
| <b>Histologically</b>      | <p>-it's the largest of salivary glands.</p> <p>-its encapsulated مغلفة</p> <p>-its <b>intercalated ducts:</b> are long and</p>   | <p>-its encapsulated</p> <p><b>- intercalated ducts:</b> <u>shorter</u> than those of the parotid.</p> <p>ويتكون مش واضحة</p>  | <p>-the capsule is poorly developed. الغلاف بيبقى ضعيف ومش كبير</p> <p>-connective tissue septa are prominent.</p>   |

|  |  |  |  |
|--|--|--|--|
|  | <p>وینقذر. ونشوفها بوضوح بین ال acini</p> <p>-its <b>striated ducts</b>: pale stained .</p> <p>- <b>(characteristic feature)</b> : its connective tissue septa are prominent with <u>fat cells</u> that increase with age.</p> | <p>-<b>striated ducts</b>: longer than those of parotid.</p> | <p>-intercalated and striated ducts are poorly developed .</p> |
|--|--|--|--|

### {B} Minor salivary glands:

- They are located near the epithelium in almost all parts of oral cavity.
- They are found in the submucosa of mucous membrane except that of **gingiva** and the **anterolateral zone of hard palate**.
- They are distinct salivary glands.
- They consist of several small groups of secretory units that open by short ducts directly into the mouth. (without branching)
- They lack a distinct capsule.
- They produce a mucoprotein rich secretion ( may be either **mucous** or **mixed but predominantly mucous**) except **von Ebner gland** which is **pure serous**.

## 1. Labial and buccal glands:

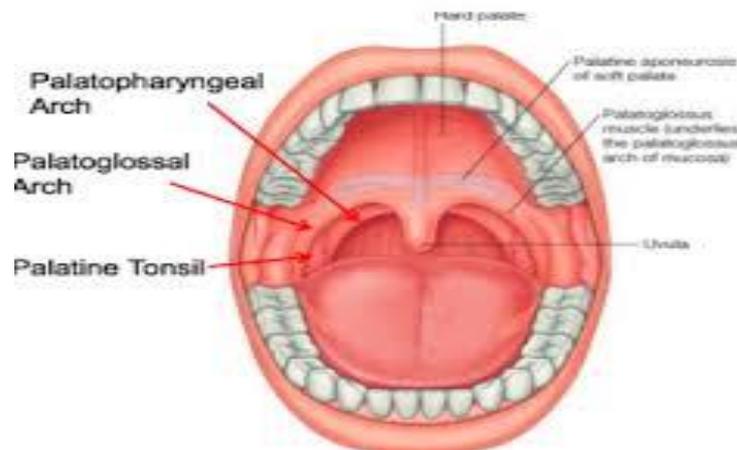
|                       | Labial  | Buccal                                |
|-----------------------|---|---------------------------------------|
| <b>Site</b>           | -above the orbicularis oris muscle.<br>-found mostly at lower lip.                                      | -between fibers of buccinator muscle. |
| <b>Type</b>           | Pure mucous   | Mixed predominantly mucous            |
| <b>histologically</b> | -they contain short intercalated ducts.<br>-the striated ducts contain few cells with basal striations. |                                       |

## 2. Glossopalatine glands:

❖ **Site:** at the region of isthmus of palatoglossal arch (at the glossopalatine fold ) connecting between palate and tongue.

- Isthmus: هو جزء من النسيج اللي فوق اللسان

❖ **Type:** pure mucous glands



## 3. Palatine glands:

❖ **Site:** consist of glandular aggregates in the submucosa of posterolateral zone of hard palate , soft palate and uvula.

❖ **Type:** pure mucous.

❖ **Number:** 250 → hard palate

100 → at soft palate

12 → at uvula

#### 4. Lingual glands: (mucous glands of the tongue)

##### ➤ Anterior lingual glands:

##### (Blandin-nuhn):

- Located near the apex of the tongue.
- **The anterior part:** is pure mucous.
- **The posterior part:** is mixed predominantly mucous.
- The ducts open on the ventral surface of the tongue near the lingual frenum.

##### ➤ The posterior lingual glands include :

##### 1) Von Ebner glands :

- located **between the muscle fibers of the tongue** below the circumvallate papillae .
- Their ducts open into the **trough** of the circumvallate and foliate papillae.
- Which are **pure serous** glands . (the only one in minor ), **and the reason is :**
  - \*their secretion serve to **washout** the trough of the papillae .
  - \*they have significant digestive function due to the its secretion of **amylase** and **lipase** enzymes .
  - \*they have an important protective function due to the presence of the antibacterial enzymes **peroxidase** and **lysozyme** in these glands .

## 2)The Weber glands :

- They are **pure mucous** glands .
- located in the **posterior part** of the tongue .
- their ducts open into the **dorsal surface** of the tongue through the **lingual crypts** .

### ❖ Structural age changes of the salivary glands :

#### I)Changes in the terminal portions (acini ) of the salivary glands:

- The number of the secretory ends **decreases** by age after 40 years .
- Serous acini **replaced by mucous** or fat cells .
- Atrophy (ضمور) of part or whole acini either by fibrous tissue “**fibrosis**” or by fatty tissue “ **fatty degeneration**”

(من ضمن التغيرات التي تحصل ف ال acini ان جزء منها او كلها يموت ال tissue fibrous التي جواه او تتملى بالدهون تماما )

- The secretory cells **decreases in height and width** , the nuclei of such cells show **pyknosis** and show **lipoid inclusions** in their cytoplasm .

#### II)Changes in the duct system:

- most of the intercalated ducts **disappear** due the change of the cells of its epithelial lining into secretory cells which are **mucous** .
- the striations of some **striated ducts** become **less** in number or even disappear .
- the epithelial lining of the **excretory ducts** changes to **flattened cells**
- Some duct walls become surrounded by excessive **fibrous C.T.**
- The large ducts show **stagnated mucous** secretion . ( بيحصلها انسداد )

-Oncocyte cells **increase in number** to represent age changes .

### III)Changes in the connective tissue of the salivary glands:

-The connective tissue become **thicker( due to fibrosis)** and show **fatty inclusions** .

- there is large number of **lymphocytes** .

#### As a conclusion :

\*The changes in acini and ducts cause **change of most of saliva from serous to mucous** .

\*And the degeneration of many structures cause **less saliva secretion** , so **people above 50 suffer from dry mouth** .

#### ❖ Functions of salivary glands :

1)Saliva production and secretion : the **most important** function of salivary glands is the production and secretion of saliva .

2)Iodine metabolism : Iodine concentration mechanism is located in the cells of the **striated ducts** .

3)Parotin hormone : **Parotid glands** secrete parotin hormone that is important for :

\*promote the growth of mesenchymal tissues.

\*lowers serum calcium in rabbits .

\*Stimulates calcification of rat incisor dentin .

\*increase bone marrow temperature and increase the circulating leukocytes .

4) Immunoglobulins : The **plasma cells** in the C.T of the salivary glands produce **IgA** .

5) Epidermal growth factor : this factor is **not found** in human salivary glands but rodents , its important for :

\*its may involved in wound healing .

\*influence tooth eruption .

\*influence epidermal keratinization .

6) Nerve growth factor :

-Its localized in the **submandibular gland of the mice** .

- its **not found** in human glands .

-it stimulate the growth of sympathetic ganglion cells .

7) Enzymes and active substances :

-the salivary glands secrete several enzymes as **peroxidase** , **thiocyanate** , **sialin** , **lysozyme** and **amylase** .

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### the saliva:

- the total volume secreted daily by human is **750 mls**
- **60%** is produced by the **submandibular glands**
- **30%** by the **parotid glands**
- **5%** or less by the **sublingual**
- **6%** by the **minor salivary glands**
- **PH:** 6.7 TO 7.4
- **composition:** 99% water and 1% solid ingredients
- **types:** ductal saliva ( **pure glandular secretions**) and whole saliva

ال **ductal** ده اللي طالع من ال **main duct** ف بييقى **pure** لكن بعد اما  
بيمشي ف الفم بيختلط مع حاجات تانية زي ال بكتريا وكدا ف بيقى. **Whole**

---

### functions of saliva:

#### 1- Digestive function:

a. mechanically: by

- bringing the food components into solution مع امتزاج الاكل

الماء

- lubricating the bolus of food for deglutition

اغلف جزيئات الاكل ب mucin علشان ميعورش أثناء البلع

b. chemically:

- through the action of its digestive enzymes:

- **carbohydrates digestion:** initiates by amylase enzyme
- **lipid digestion:** initiates by lingual lipase enzyme
- **protein digestion:** initiates by proteolytic enzymes

- it provides taste activity:

- saliva is required to dissolve substances to be tasted and to carry them to taste buds
- it also contains a protein called **gustin** is necessary for growth and maturation of the taste buds

بيساعد في نموه مرة أخرى

c. it neutralizes esophageal contents and dilutes **بيخفف** gastric chyme (in **stomach**)

## 2- protection:

by several ways:

- it keeps the oral tissue moist and facilitates swallowing **ابتلاع** and speaking

- the mucous glycoprotein content provide :

- lubrication for movements of the oral tissue against each other **بيساعد في حركة الفم**

- protection of the lining mucosa by forming a barrier

Against noxious stimuli (chemical, thermal, or minor traumatic insults)

بتعمل حاجز ضد البكتيريا والسموم

- its fluid **consistency** **تماسك** provides washing action which flushes away debris from the mouth **تماسك السائل بتاعها بيساعد**

في انه يشيل بقايا الاكل من ع الأسنان

- helps to protect teeth from dental caries by cleaning and buffering action **بتحمي الاسنان من التسوس**

### 3- Buffering: التعادل

the buffering action of saliva occurs by its content of {bicarbonate and phosphate ions and by salivary proteins (sialin)}

it protect the oral cavity by two ways:

- a. by buffering and washing acids produced by plaque microorganism from sugar  
بيشيل الاحماض اللي بتنتج من الميكروبات
- b. by preventing microorganisms from colonizing the mouth by denying them optimal environmental conditions  
استعمار  
بمنع الميكروبات انها تستعمر الفم عن طريق اننا منوفرش البيئة المناسبة لوجودها

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### 4- Antimicrobial action:

by 4 system:

1. **lysozyme**: can hydrolyze the cell wall of some bacteria
2. **lactoferrin**: it is an { iron-binding protein } which binds free iron and so doing deprives bacteria from their essential element  
اكثر element بتحتاجه البكتريا علشان تنمو هو الحديد ف وجود ال lactoferrin وهو عبارة عن بروتين بيمسك ف الحديد يبقى هيمسك ف الحديد اللي موجود ف كذا مش هنوفر البيئة اللي محتاجها البكتيريا
3. **immunoglobulins: (Type A)**
  - produced by plasma cells
  - located in the connective tissue of the salivary gland
  - have the capacity to agglutinate microorganisms عندها القدرة انها تجمع البكتريا
  - to prevent their adherence to the oral cavity التصاق
4. **bactericidal system: by** بتقتل البكتيريا

- iodine and potassium thiocyanate secreted by (the duct system )
  - peroxidase secreted by ( the acinar cells)
- 

**5- maintenance of tooth integrity** سلامة : protect the tooth by:

- protect it from dental caries by cleaning & buffering action
  - diffusion of ions as: (  $Ca^{++}$ , mg,  $Cl^-$ , fluorine and phosphorus) result in post-eruptive maturation
  - this maturation
    - increase surface hardness of enamel
    - decreases permeability of enamel
    - increase the resistance of enamel to caries
  - calcium-binding proteins occur in saliva and help forming salivary pellicle غشاء which behaves as a protective membrane
- 

**6- tissue repair: (in rodents)** في القوارض وليس الإنسان

- the presence of epidermal growth factor in saliva increases the rate of wound contraction

وجود عامل النمو بيزيد من معدل تقلص والتئام الجرح

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**7- parotin hormone: ( secreted by parotid gland)**

- promote:

- the growth of mesenchymal tissue
  - lower serum calcium يقلل الكالسيوم ف الدم
  - increase circulating leukocytes ( by increase temperature of bone marrow)
- 

**8- other functions in animals:**

- thermoregulation in mammals الثدييات cause lacking sweat glands
  - secretion of toxic substances
-

## salivary glands interrelation with the endocrine

### glands: علاقة العدد اللعابية بالغدد الصماء

- the thyroid and pituitary hormones:  
have implicated in amount and type of saliva
- adrenocorticotrophic or mineralocorticoids hormones:  
can influence the Na<sup>+</sup> and K<sup>+</sup> ratio, increased in {Addison's disease and Cushing's syndrome} نسبتهم بتزيد ف الأمراض دي
- swelling of parotid glands: بتبقى وارمة عند مرضى السكر  
are observed in patients suffering from uncontrolled diabetes