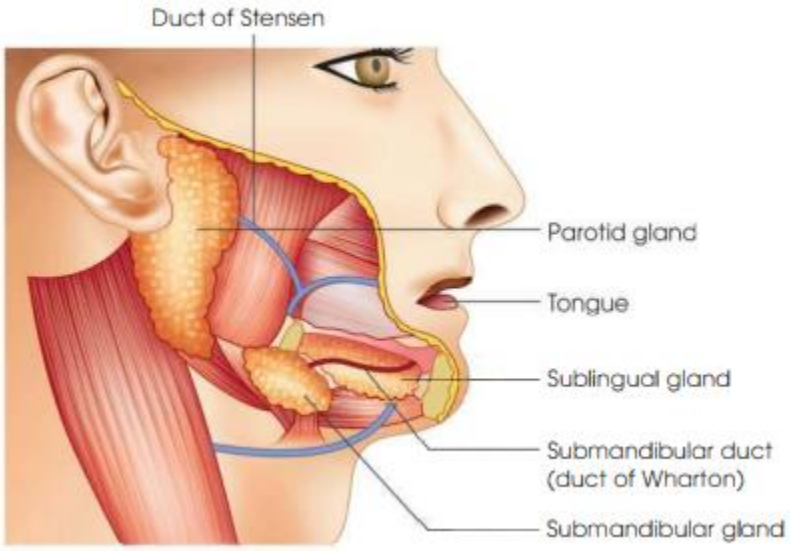
# Oral Cavity and Salivary Glands

## Types of Salivary Glands:

**A/ Major Salivary Glands:** There are three pairs of salivary glands. One of each pair remains on one side and opens into the oral cavity**.**

1. **The parotid glands:** The parotid gland opens upon the inner surface of the cheek opposite the second upper molar tooth, by a single duct called the duct of Stensen. It secrete almost entirely the serous type of secretion**.**
2. **Submandibular and Sublingual glands:** secrete both serous secretion and mucus.
   The submaxillary gland similarly opens by Wharton's duct upon the floor of the mouth on the side of the frenulum of the tongue. The sublingual gland, on the other hand, opens by several fine ducts, upon the floor of the mouth by the side of the frenulum. These are called the ducts of Rivinus.

**B/ Minor Salivary Glands:** they are many tiny buccal glands that secrete only mucus.




## Saliva contains two major types of protein secretion:

(1) a *serous secretion* that contains *ptyalin* (an *α-amylase*), which is an enzyme for digesting starches.
(2) *mucus* secretion that contains mucin for lubricating and for surface protective purposes.
Daily secretion of saliva normally ranges between 800 and 1500 ml.

**Functions of saliva:**

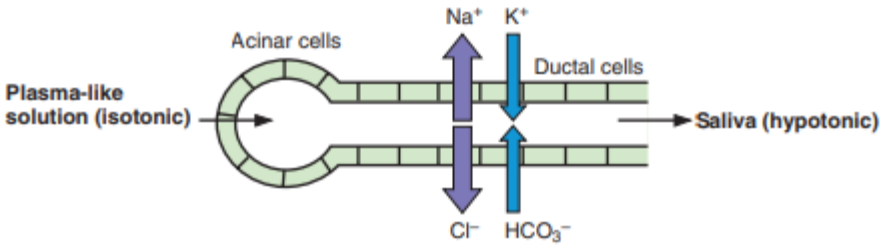
a. Initial starch digestion by α-amylase (ptyalin).
b. Initial triglyceride digestion by lingual lipase (Salivary lingual lipase has a pH 4.0 and its get activated after reaching the acidic environment of the stomach).
c. Lubrication of ingested food by mucus.
d. Protection of the mouth and esophagus by dilution and buffering of ingested foods.
e. Constant flow of saliva washes down the food debris and thereby does not allow the bacteria to grow.
f. Saliva excretes urea, heavy metals (Hg, Pb, Bi, As, etc.), thiocyanates, certain drugs like iodide, etc. Alkaloids, such as morphine, antibiotics, such as penicillin, streptomycin, etc. are also excreted in the saliva. The excretion of ethyl alcohol by the salivary gland has promoted the recommendation that such a test should be used for medicolegal purpose.
g. Helps in the sensation of taste: Taste is a chemical sensation. Unless the substances are in solution the taste buds cannot be stimulated. Saliva acts ﷺs a solvent and is thus essential for taste.
h. Helps water balance: When body water is lost (sweating, diarrhea, etc.)-saliva is reduced and thirst is felt. The subject feels the necessity of drinking water and thus water balance is restored.
i. Bacteriolytic action: The bacteriolytic action is mediated via antimicrobial agents such as immuno globulin A and lysosomal action. The other antimicrobial enzymes that kill bacteria are salivary lactoperoxidase and lactoferrin.

**Composition of saliva:** The composition of saliva varies with the salivary flow rate

1. At the lowest flow rates, saliva has the lowest osmolarity and lowest Na +, Cl − and HCO3 - concentrations but has the highest K + concentration.
2. At the highest flow rates (up to 4 mL/min), the composition of saliva is closest to that of plasma.

■The structure of each gland is similar to a bunch of grapes. The acinus (the blind end of each duct) is lined with acinar cells and secretes an initial saliva. A branching duct system is lined with columnar epithelial cells, which modify the initial saliva.

■When saliva production is stimulated, myoepithelial cells, which line the acinus and initial ducts, contract and eject saliva into the mouth.




a. The acinus

■produces an initial saliva with a composition similar to plasma.

■This initial saliva is isotonic and has the same Na +, K + , Cl − and HCO3- concentrations as plasma.

b. The ducts

■modify the initial saliva by the following processes:

1. The ducts reabsorb Na+ and Cl - therefore, the concentrations of these ions are lower than their plasma concentrations.
2. The ducts secrete K + and HC03 - therefore, the concentrations of these ions are higher than their plasma concentrations.
3. Aldosterone acts on the ductal cells to increase the reabsorption of Na+ and the secretion of K+(analogous to its actions on the renal distal tubule.)
4. Saliva becomes hypotonic in the ducts because the ducts are relatively impermeable to water. Because more solute than water is reabsorbed by the ducts, the saliva becomes dilute relative to plasma.
5. The effect of flow rate on saliva composition is explained primarily by changes in the contact time available for reabsorption and secretion processes to occur in the ducts.

■ Thus, at high flow rates, saliva is most like the initial secretion from the acinus; it has the highest Na+ and Cl− concentrations and the lowest K+ concentration.

■ At low flow rates, saliva is least like the initial secretion from the acinus; it has the lowest Na+ and Cl− concentrations and the highest K+ concentration.

■ The only ion that does not “fit” this contact-time explanation is HCO3 − ; HCO3 − secretion is selectively stimulated when saliva secretion is stimulated.

■ It also contains the following substances:

– Ptyalin, an α-amylase, starts the process of digestion of complex carbohydrates.

– Lingual lipase starts the process of digestion of triglycerides.

– Lysozyme, immunoglobulin A (IgA), and lactoferrin help prevent bacterial overgrowth in the oral cavity.

**Regulation of saliva production:**

■ Saliva production is controlled by the parasympathetic and sympathetic nervous systems (not by GI hormones).

a. Parasympathetic stimulation (cranial nerves VII and IX) increases saliva production. Anticholinergic drugs like atropine inhibit the production of saliva and cause dry mouth.

Saliva production is increased (via activation of the parasympathetic nervous system) by food in the mouth, smells, conditioned reflexes, and nausea.

Saliva production is decreased (via inhibition of the parasympathetic nervous system) by sleep, dehydration, fear, and anticholinergic drugs.

b. Sympathetic stimulation produces either a small flow, which is rich in protein, or no flow at all. The effects are smaller than those of parasympathetic stimulation.

**Disturbances of Salivary Secretion**:

1. When decrease or absent called hyposalivation.
2. When increase called hypersalivation

**Hyposalivation:**

1. Temporary: Emotional state, e.g. anxiety, fear, fever and obstruction of the duct due to calculi (sialolithiasis).
2. Permanent: Aptyalism is rare but when occurs is due to congenital hypoplasia or absence of the gland.
3. Xerostomia: This is commonly seen in any acute stressful conditions in which patients complain of dryness of mouth. This is attributed to sympathetically induced decreased secretion of saliva in various stress induced pathological diseases.

**Hypersalivation:**

Sialorrhea: The continuous and persistent increase in salivary secretion leads to sialorrhea. It is also caused in various conditions such as:

- Pregnancy.
- Neoplasm of the mouth, tongue, carious tooth, oesophagus, stomach and pancreas.
- Ulceration of esophagus and stomach, spasm of stomach.
- Neurological disorder, e.g. parkinsonian disease and schizophrenia.

**MASTICATION (CHEWING):** Chewing or mastication is the process by which food is crushed and ground by teeth. It is the first step of digestion, and it increases the surface area of foods to allow a more efficient break down by enzymes. During the mastication process, the food is positioned by the cheek and tongue between the teeth for grinding. The muscles of mastication move the jaws to bring the teeth into intermittent contact, repeatedly occluding and opening. As chewing continues, the food is made softer and warmer, and the enzymes in saliva begin to break down carbohydrates in the food.

**SWALLOWING (DEGLUTITION):** the act of passing food from the mouth, by way of the pharynx (or throat) and esophagus, to the stomach. In general, swallowing can be divided into the following stages:
(1) a voluntary stage, which initiates the swallowing process;
(2) a pharyngeal stage, which is involuntary and constitutes passage of food through the pharynx into the esophagus; and
(3) an esophageal stage, another involuntary phase that transports food from the pharynx to the stomach.