

Oral Cavity

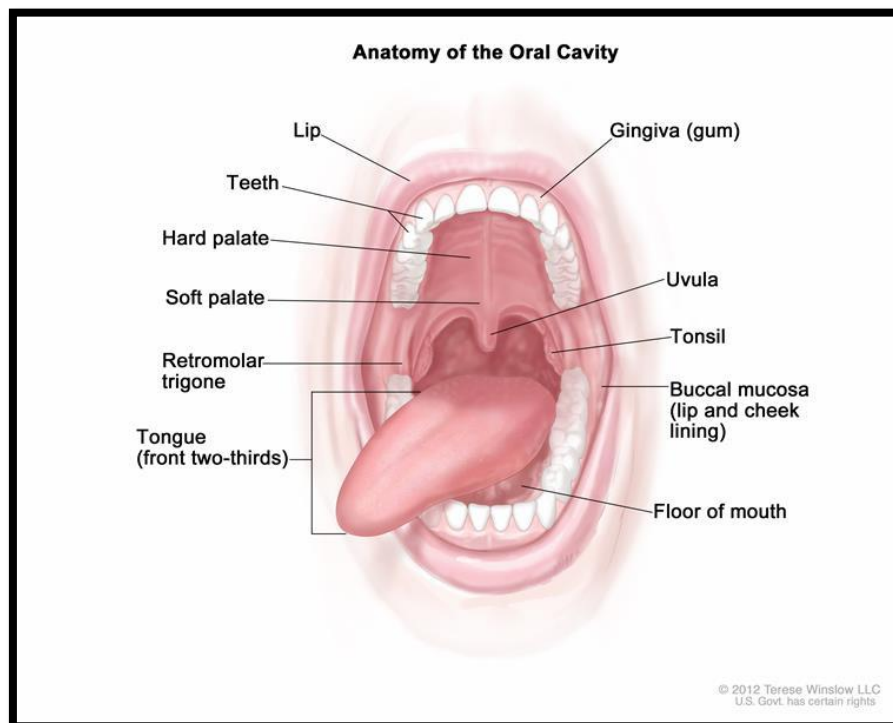
The **oral cavity** (figure 1), or mouth, is that part of the digestive tract bounded by the lips anteriorly, the throat; opening into the pharynx posteriorly, the cheeks laterally the palate superiorly, and a muscular floor inferiorly. The oral cavity is divided into two regions:

(1) The **vestibule**

Which is the space between the lips or cheeks and the alveolar processes, which contain the teeth

(2) The **oral cavity proper,**

Which lies medial to the alveolar processes. The oral cavity is lined with moist stratified squamous epithelium, which provides protection against abrasion.



Oral cavity (figure 1)

Lips and Cheeks

The **lips**, are muscular structures formed mostly by the **orbicularis oris** muscle, as well as connective tissue. The outer surfaces of the lips are covered by skin.

The **cheeks** form the lateral walls of the oral cavity. They consist of an interior lining of moist stratified squamous epithelium and an exterior covering of skin. The substance of the cheek includes the **buccinator muscle**, which flattens the cheek against the teeth, and the **buccal fat pad**, which rounds out the profile on the side of the face. The lips and cheeks are important in the processes of mastication and speech. They help manipulate food within the mouth and hold it in place while the teeth crush or tear it. They also help form words during the speech process. A large number of the muscles of facial expression are involved in movement of the lips.

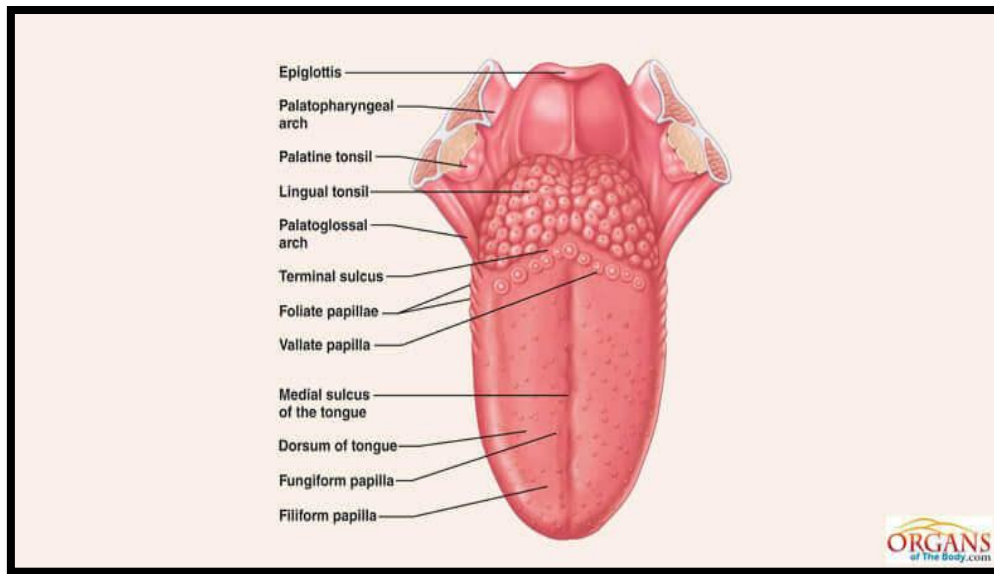
Palate

The **palate** consists of two parts, an anterior bony part, the **hard palate**, and a posterior, the **soft palate**, which consists of skeletal muscle and connective tissue. The **uvula** is the projection from the posterior edge of the soft palate. The palate is important in the swallowing process; it prevents food from passing into the nasal cavity.

Tongue

The **tongue** is a large, (figure 2), muscular organ that occupies most of the oral cavity proper when the mouth is closed. Its major attachment in the oral cavity is through its posterior part. The anterior part of the tongue is relatively free and is attached to the floor of the mouth by a thin fold of tissue called the **frenulum**. The muscles associated with the tongue are divided into two categories: **intrinsic muscles**, which are within the tongue itself; and **extrinsic muscles**, which are outside the tongue but attached to it. The intrinsic muscles are largely responsible for changing the shape of the tongue, such as flattening and elevating the tongue during drinking and swallowing. The extrinsic tongue muscles protrude and retract the tongue, move it from side to side, and change its shape.

A groove called the **terminal sulcus** divides the tongue into two parts. The part anterior to the terminal sulcus accounts for about two-thirds of the surface area and is covered by papillae, some of which contain taste buds. The posterior one-third of the tongue is devoid of papillae and has only a few scattered taste buds. It has, instead, a few small glands and a large amount of lymphoid tissue,



Tongue (figure 2)

Teeth

Normal adults have 32 **teeth**, which are distributed in two **dental arches**. One is called the maxillary arch and the other is called the mandibular arch. The teeth in the right and left halves of each dental arch are roughly mirror images of each other. As a result, the teeth are divided into four quadrants: right upper, left upper, right lower, and left lower. The teeth in each quadrant include one central and one lateral **incisor**, one **canine**, first and second **premolars**, and first, second, and third **molars**. The third molars are called **wisdom teeth** because they usually appear in a person's late teens or early twenties, when the person is old enough to have acquired some wisdom.

Mastication

Food taken into the mouth is **chewed**, or **masticated**, by the teeth. The anterior teeth, the incisors, and the canines primarily cut and tear food, whereas the premolars and molars primarily crush and grind it. Mastication breaks large food particles into smaller ones, which have a much larger total surface area. Because digestive enzymes digest food molecules only at the surface of the particles, mastication increases the efficiency of digestion.

Four pairs of muscles move the mandible during mastication:

- 1- **Temporalis.**
- 2- **masseter.**
- 3- **medial pterygoid.**
- 4- **lateral pterygoid.**

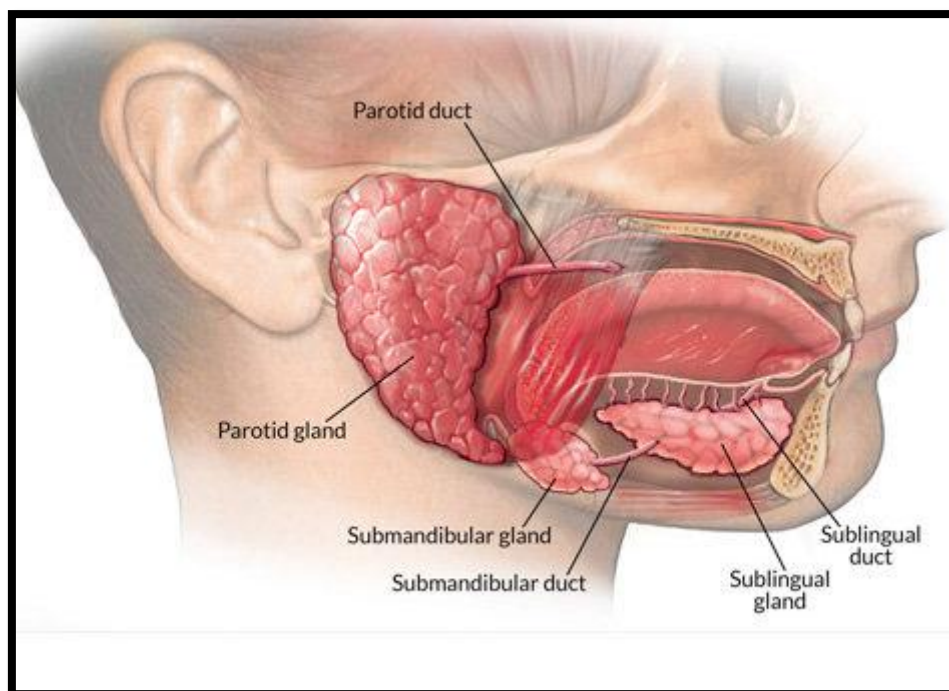
The temporalis, masseter, and medial pterygoid muscles close the jaw; and the lateral pterygoid muscle opens it. The medial and lateral pterygoids and the masseter muscles accomplish protraction and lateral and medial excursion of the jaw. The temporalis retracts the jaw. All these movements are involved in tearing, crushing, and grinding food.

The **chewing**, or **mastication, reflex**, which is integrated in the medulla oblongata, controls the basic movements involved in chewing. The presence of food in the mouth stimulates sensory receptors, which activate a reflex that causes the muscles of mastication to relax. The muscles are stretched as the mandible is lowered, and stretch of the muscles activates a reflex that causes contraction of the muscles of mastication. Once the mouth is closed, the food again stimulates the muscles of mastication to relax, and the cycle is repeated.

Salivary Glands

A considerable number of **salivary glands (figure 3)**, are scattered throughout the oral cavity. Three pairs of large multicellular glands exist:

- 1-The parotid.
- 2-The submandibular.
- 3-The sublingual glands



Salivary glands (figure 3)

In addition to these large consolidations of glandular tissue, numerous small, coiled tubular glands are located deep to the ep-ithelium of the tongue (lingual glands), palate (palatine glands), cheeks (buccal glands), and lips (labial glands). The secretions from these glands help keep the oral cavity moist and begin the process of digestion.

The largest salivary glands:

1- The parotid glands are serous glands, which produce mostly watery saliva, and are located just anterior to the ear on each side of the head. Each **parotid duct** exits the gland on its anterior margin, crosses the lateral surface of the masseter muscle, pierces the buccinators muscle, and enters the oral cavity adjacent to the second upper molar.

2-The submandibular glands are mixed glands with more serous than mucous alveoli. A submandibular duct exits each gland, passes anteriorly deep to the mucous membrane on the floor of the oral cavity, and opens into the oral cavity beside the frenulum of the tongue.

In certain people, if the mouth is opened and the tip of the tongue is elevated, the submandibular ducts are compressed and saliva may squirt out of the mouth from the openings of these ducts.

3- The sublingual glands are smallest of the three large, paired salivary glands, are mixed glands containing some serous alveoli but consisting primarily of mucous alveoli. They lie immediately below the mucous membrane in the floor of the mouth. These glands do not have single, well-defined ducts like those of the submandibular and parotid glands. Instead, each sublingual gland opens into the floor of the oral cavity through 10–12 small ducts.

Saliva

Saliva is a combination of serous and mucous secretions from the various salivary glands, secreted at the rate of about 1–1.5 L/day. The serous part of saliva, produced mainly by the parotid and submandibular glands, contains a digestive enzyme called salivary amylase, which breaks the covalent bonds between glucose molecules in starch and other polysaccharides to produce the disaccharides maltose and isomaltose. The release of maltose and isomaltose gives starches a sweet taste in the mouth. Food spends very little time in the mouth, however; therefore, only about 3%–5% of the total carbohydrates are digested in the mouth. Most of the starches are covered by cellulose in plant tissues and are inaccessible to salivary amylase. Cooking and thorough chewing of food destroys the cellulose covering and increase the efficiency of the digestive process.

Saliva prevents bacterial infection in the mouth by washing the oral cavity. Saliva also contains substances, such as lysozyme, which has a weak antibacterial action, and immunoglobulin A, which helps prevent bacterial infection. Any lack of salivary gland secretion increases the chance of ulceration and infection of the oral mucosa

and of caries in the teeth. The mucous secretions of the submandibular and sublingual glands contain a large amount of mucin, a proteoglycan that gives a lubricating quality to the secretions of the salivary glands.

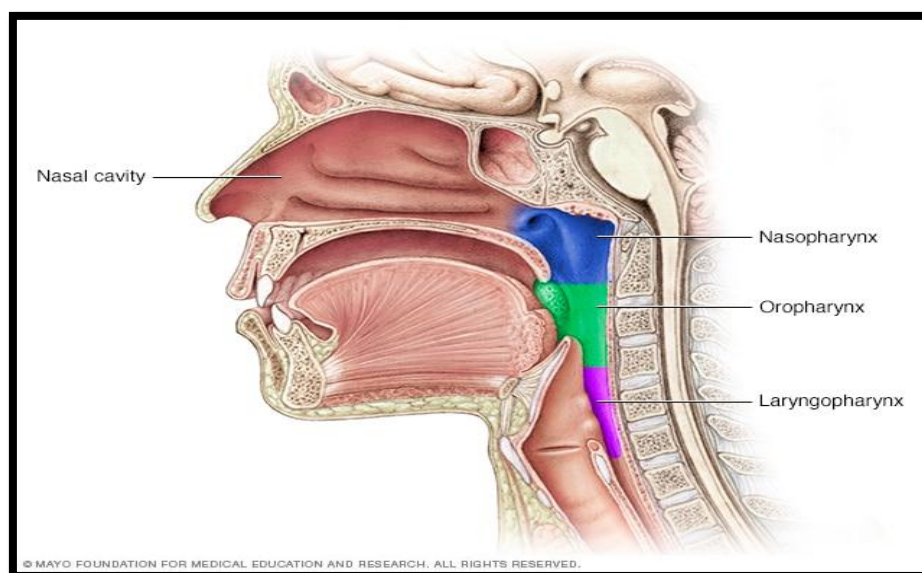
Salivary gland secretion is stimulated by the parasympathetic and sympathetic nervous systems, with the parasympathetic system being more important. Salivary nuclei in the brainstem increase salivary secretions by sending action potentials through parasympathetic fibers of the facial (VII) and glossopharyngeal (IX) cranial nerves in response to a variety of stimuli, such as tactile stimulation in the oral cavity or certain tastes, especially sour. Higher centers of the brain also affect the activity of the salivary glands. Odors that trigger thoughts of food or the sensation of hunger can increase salivary secretions.

Pharynx

The pharynx consists of three parts: (figure 4)

- 1-The nasopharynx
- 2-The oropharynx
- 3-The laryngopharynx.

Normally, only the oropharynx and laryngopharynx transmit food. The **oropharynx** communicates with the nasopharynx superiorly, the larynx and **laryngopharynx** inferiorly, and the mouth anteriorly. The laryngopharynx extends from the oropharynx to the esophagus and is posterior to the larynx. The posterior walls of the oropharynx and laryngopharynx consist of three muscles: the superior, middle, and inferior **pharyngeal constrictors**, which are arranged like three stacked flowerpots, one inside the other. The oropharynx and the laryngopharynx are lined with moist stratified squamous epithelium, and the nasopharynx is lined with ciliated pseudostratified columnar epithelium.



The pharynx (figure 4)

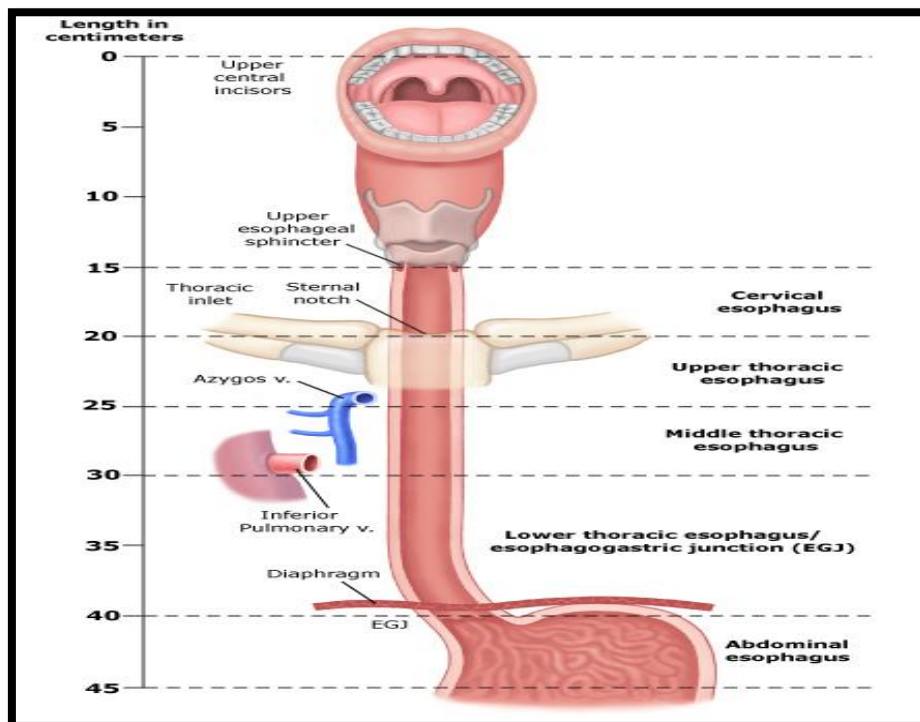
Esophagus

The **esophagus** (figure 5) is that part of the digestive tube that extends between the pharynx and the stomach. It is about 25 cm long, anterior to the vertebrae and posterior to the trachea. It passes through the esophageal hiatus (opening) of the diaphragm and ends at the stomach. The esophagus transports food from the pharynx to the stomach.

The esophagus has thick walls consisting of the four tunics common to the digestive tract:

- Mucosa,
- Submucosa
- Muscularis
- Adventitia.

The muscular tunic has an outer longitudinal layer and an inner circular layer, as is true of most parts of the digestive tract, but it's different because it consists of skeletal muscle in the superior part of the esophagus and smooth muscle in the inferior part. An **upper esophageal sphincter** and a **lower esophageal sphincter**, at the upper and lower ends of the esophagus, respectively, regulate the movement of materials into and out of the esophagus. The mucosal lining of the esophagus is moist stratified squamous epithelium. Numerous mucous glands in the submucosal layer produce a thick, lubricating mucus that passes through ducts to the surface of the esophageal mucosa.



The esophagus (figure 5)