

Anatomy, Function, and Diseases of the Oral Cavity

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Oral cavity is the beginning of the human digestive tract. The anatomy of the oral tract ranging from the lips to the pharynx; the salivary glands and their function; and the Waldeyer's tonsillar ring are all popular topics in examinations. Articulation of sounds and food comminution are two key functions of the oral cavity. Pathological changes in the oral cavity are indications for comprehensive clinical examination. This article presents a compact overview of the oral cavity.



Topography of the Oral Cavity

The oral cavity is the anatomic space that forms the outer limit of the alimentary canal. **It consists of the lips anteriorly, the oral vestibule, the palate, and the teeth.** The distal end is made up of the pharynx.

The oral fissure (rima oris) is the beginning of the oral cavity. The isthmus of the fauces (isthmus faucium) is the posterior edge formed by an anterior and a posterior pharyngeal arch (palatoglossal and palatopharyngeal arches).

The area between the cheeks and the teeth is referred to as the oral vestibule (or vestibulum oris). The oral cavity proper is limited by the rows of teeth at the back.

The hard and soft palate form the roof. The cheeks form the lateral walls of the cavity. The orbicularis oris muscle runs around the mouth like a ring and forms, together with the buccinator muscle (a chewing muscle), the cheek and mouth musculature.

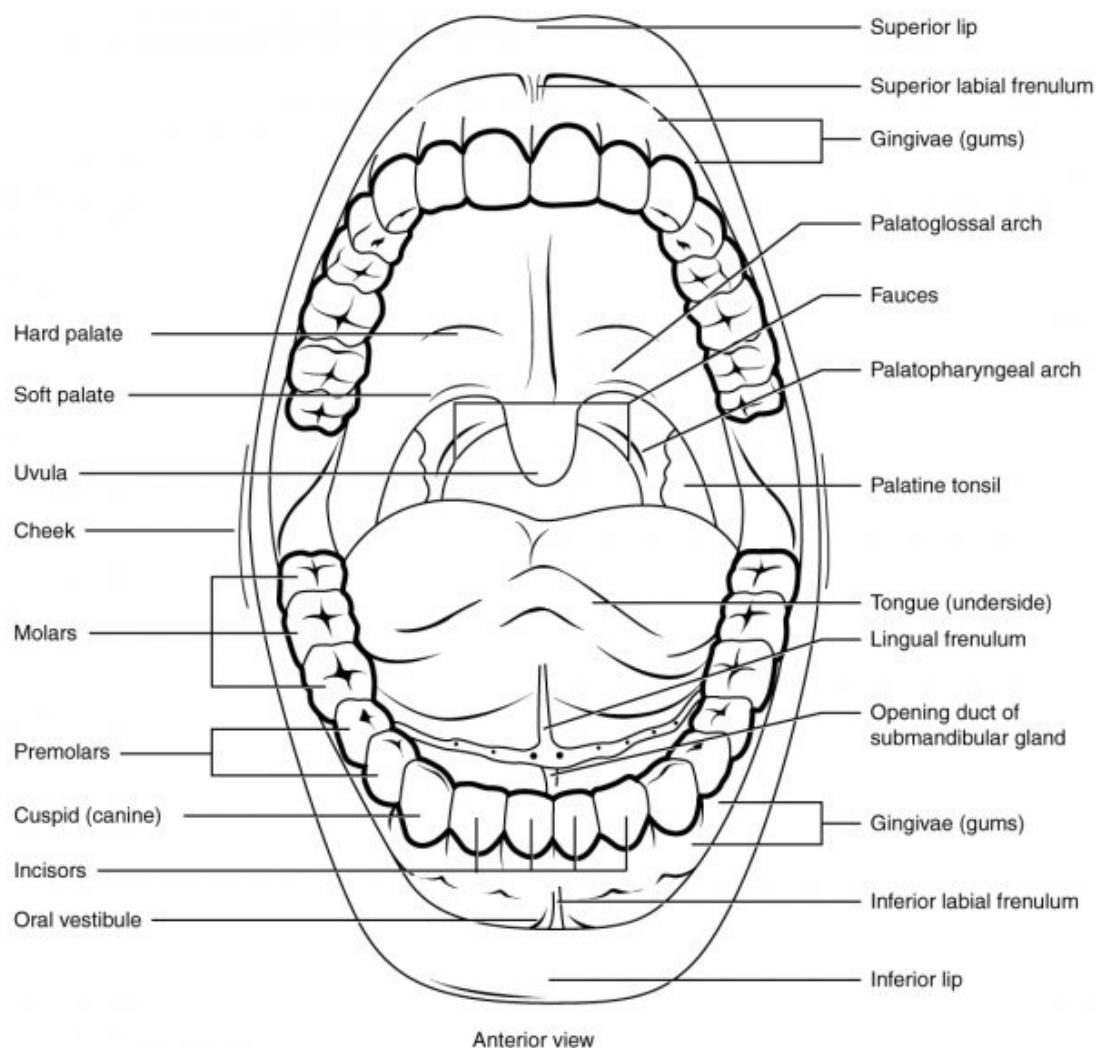


Image: Mouth. By Phil Schatz. License: [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Lips

The lips constitute the soft and movable parts of the oral cavity that facilitate the following:

- Occlusion of the oral cavity
- Tactile responses such as kissing, because the lips are also a sensory organ

The pars cutanea can be seen from the outside. It is covered with hair, lined with sebaceous and respiratory glands, and the skin is pigmented and made up of stratified squamous epithelium.

The red area of the lips, referred to as the pars intermedia, marks the transition to the interior of the lips. The tissue appears red due to the abundance of blood vessels.

Note: Cyanosis is the bluish coloration of lips, nails, and mucous membranes, which is triggered by oxygen deficiency.

The inside of the lips is referred to as pars mucosa, which is the origin of oral mucosa. It consists of non-keratinized stratified squamous epithelium. The lips are attached to the gums by the upper and lower labial frenula (frenulum labii superioris and frenulum labii inferioris). The lip musculature consists of the orbicularis oris muscle, the depressor labii inferioris muscle, and the levator labii muscle.

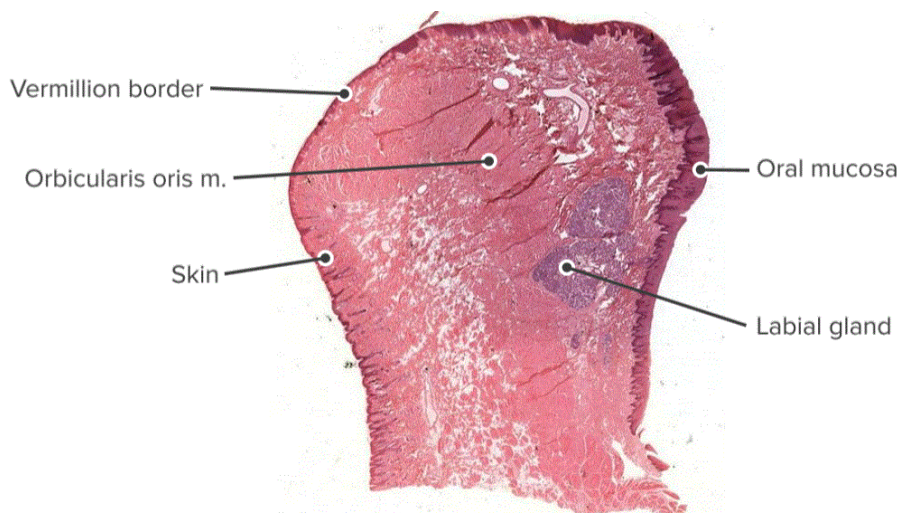


Image: Oral mucosa, vermillion border. By Lecturio.

The nerve supply of the lips is mainly derived from the trigeminal nerve. The superior lip derives its supply from the infraorbital nerve, which is a branch of the maxillary nerve while the lower lip derives its nerve supply from the mental nerve, which is a branch of the mandibular nerve.

Palate

The palate forms the roof of the mouth and the floor of the nasal cavity. It is divided into the following:

- The anterior hard palate (palatum durum) is formed by the two-palatine process of the maxilla and the palatine bones. It contains five foramina, i.e. the incisive fossa, a pair of greater palatine fossae, and a pair of lesser palatine fossae.
- The soft palate attaches behind it (palatum molle). It is soft and movable and contains the muscle tensor veli palatini posteriorly.

The two upper jaw bones and the horizontal plate of the palatine bone (lamina horizontalis) form the hard palate, which results in the median palatine suture in the sagittal orientation and the transverse palatine suture in the transverse orientation. The palatum molle consists of rough connective tissue and ends in the uvula.

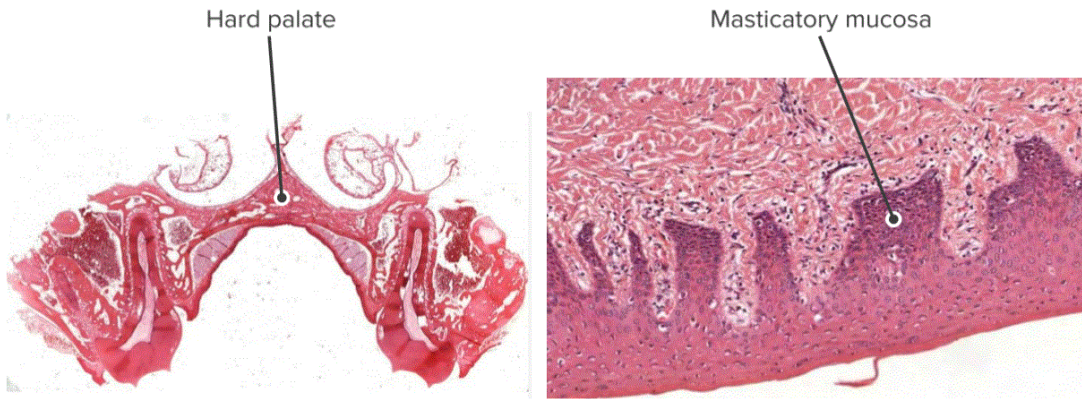


Image: Hard palate. Masticatory mucosa. By Lecturio.

Tongue

The human tongue (lingua) is divided anatomically into three parts: the root of the tongue (radix linguae), the body of the tongue (corpus linguae), and the tip of the tongue (apex linguae).

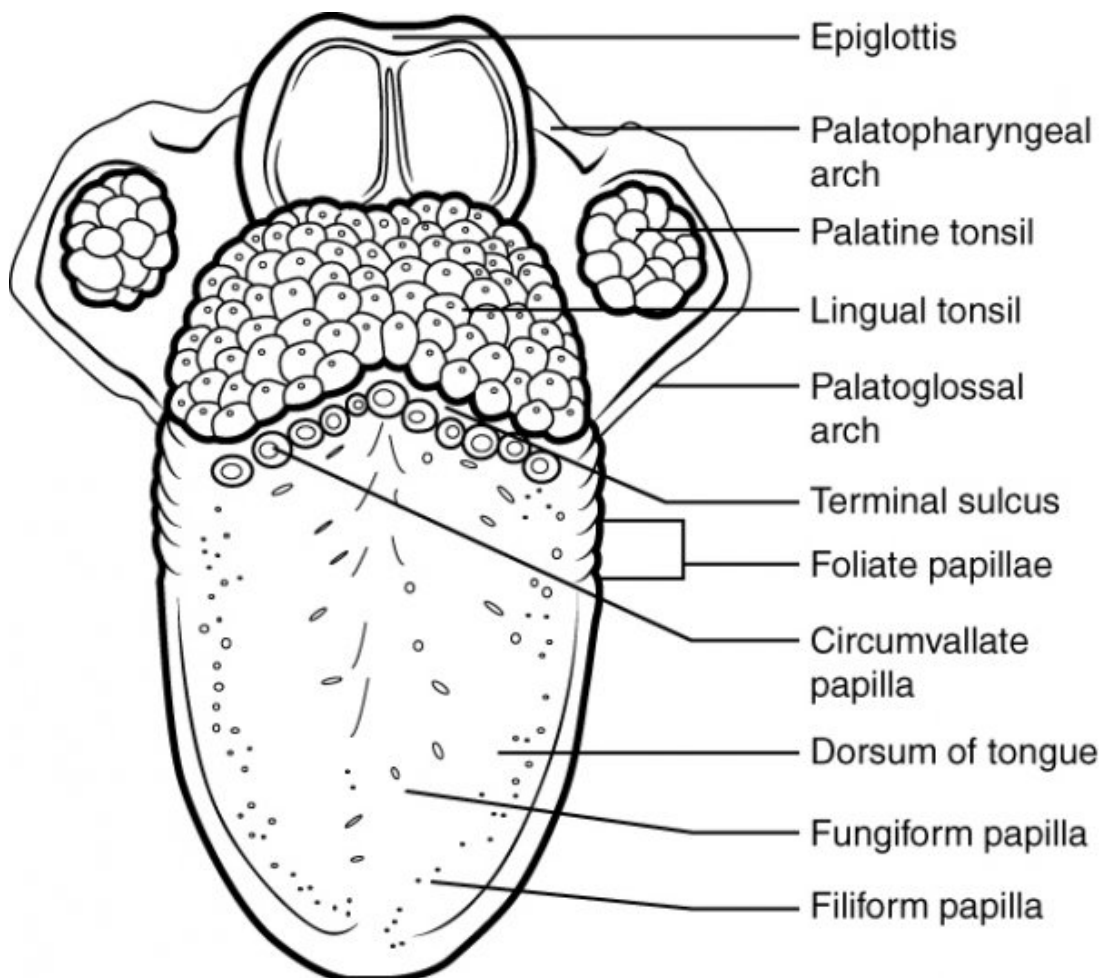


Image: Tongue. By Phil Schatz. License: [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/).

It carries the gustatory organ (organum gustus) and plays a role in processes such as

chewing, speaking, and swallowing. Therefore, the tongue consists of skeletal muscles, which allow flexibility. Most of the tongue muscles are attached to the plate of connective tissue under the tongue referred to as the lingual aponeurosis. There is a distinction between inner and outer tongue muscles. The outer muscles connect the tongue to the surrounding structures and consist of the genioglossus, the hyoglossus, the styloglossus, and the palatoglossus muscle.

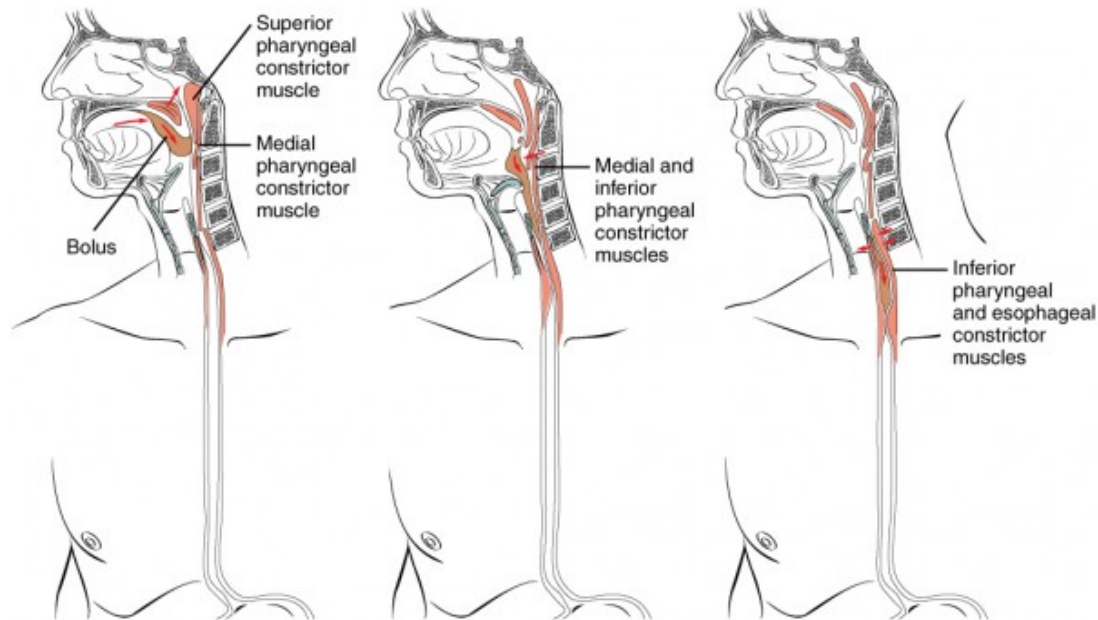


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The inner tongue muscles carry blind endings and beginnings, without a real origin or insertion. They consist of the verticalis linguae muscle, the superior longitudinal muscle, the inferior longitudinal muscle, and the transverse lingual muscle.

Note: All tongue muscles are innervated by the hypoglossal nerve (cranial nerve XII) except for the palatoglossus muscle! The vagus nerve innervates this muscle.

The tongue papillae (papillae lingualis) are located on the tongue mucosa and exhibit mechanical or gustatory function.

Tongue Papillae at a Glance	
Filiform papillae (thread-like)	Tactile, covering the surface of the tongue
Conic papillae (cone shaped)	Similar to the filiform papillae
Fungiform papillae (mushroom shaped)	Gustatory papillae located on the anterior part of the tongue
Foliate papillae (leaf shaped)	Gustatory papillae located on the posterior part of the tongue
Vallate papillae (dome shaped)	Gustatory papillae only 7-12

Teeth

Normally, an adult has 32 teeth, 16 in each jaw. They are divided into four quadrants with eight teeth each: two incisors (dentes incisivi), one canine (dens caninus), two premolars (dentes premolares), and three molars (dentes molares) make up one quadrant.

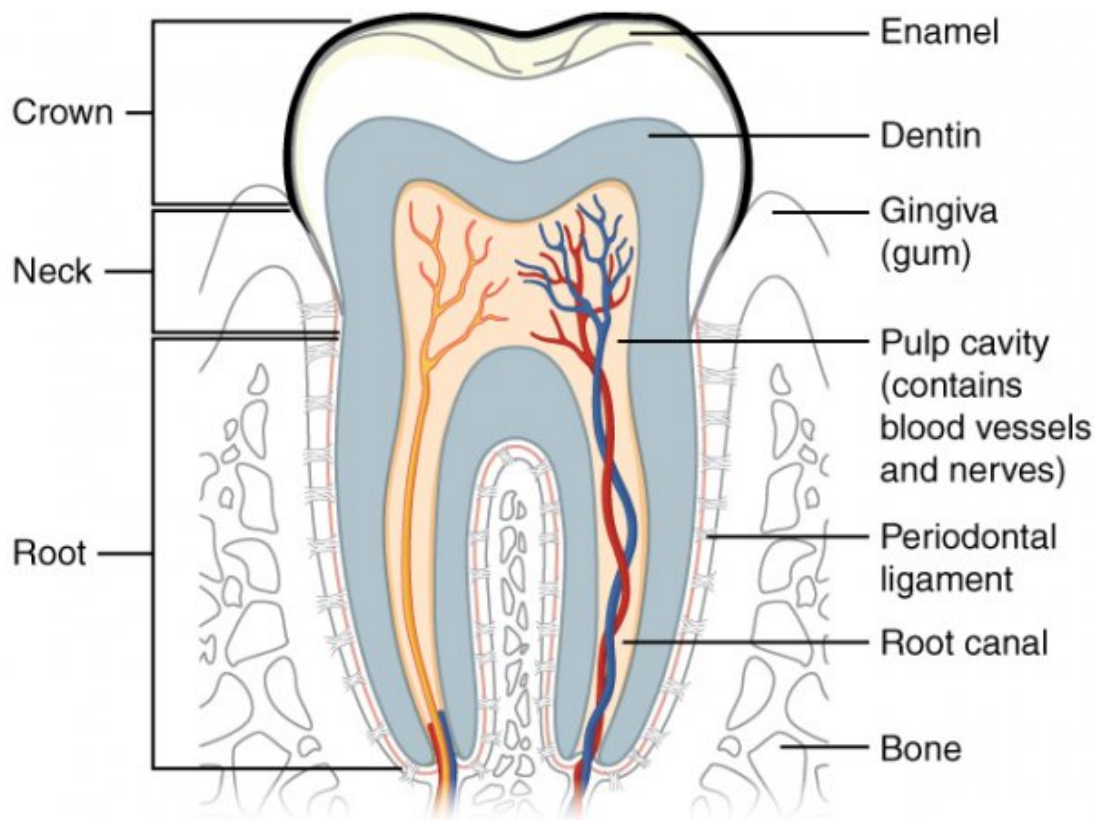


Image: Tooth. By Phil Schatz. License: [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Each tooth is located in an alveolar process and is held in position by the periodontal ligament. The teeth consist of enamel (enamelum), dentine (dentinum), and dental cement (cementum).

Note: Dental enamel is the hardest substance in the human body.

Salivary Glands

There are three major paired salivary glands including the sublingual gland, the submandibular gland, and the parotid gland.

The parotid gland is the largest of the salivary glands. It is situated on the masseter muscle in the retromandibular fossa. Cranially, there is the zygomatic arch and caudally, the angle of the mandible. The course of the excretory duct, the parotid duct, is a popular exam subject. The parotid duct runs above the masseter, pierces the buccinator muscle, and opens into the area of the second molar tooth. The parotid duct ends in the oral vestibule as the papilla. The parotid gland receives parasympathetic innervation from the inferior salivatory nucleus, passing the otic ganglion, and finally reaches the parotid gland via the auriculotemporal nerve.

Note: Mumps (parotitis epidemica) affects the parotid gland and is a common childhood disease.

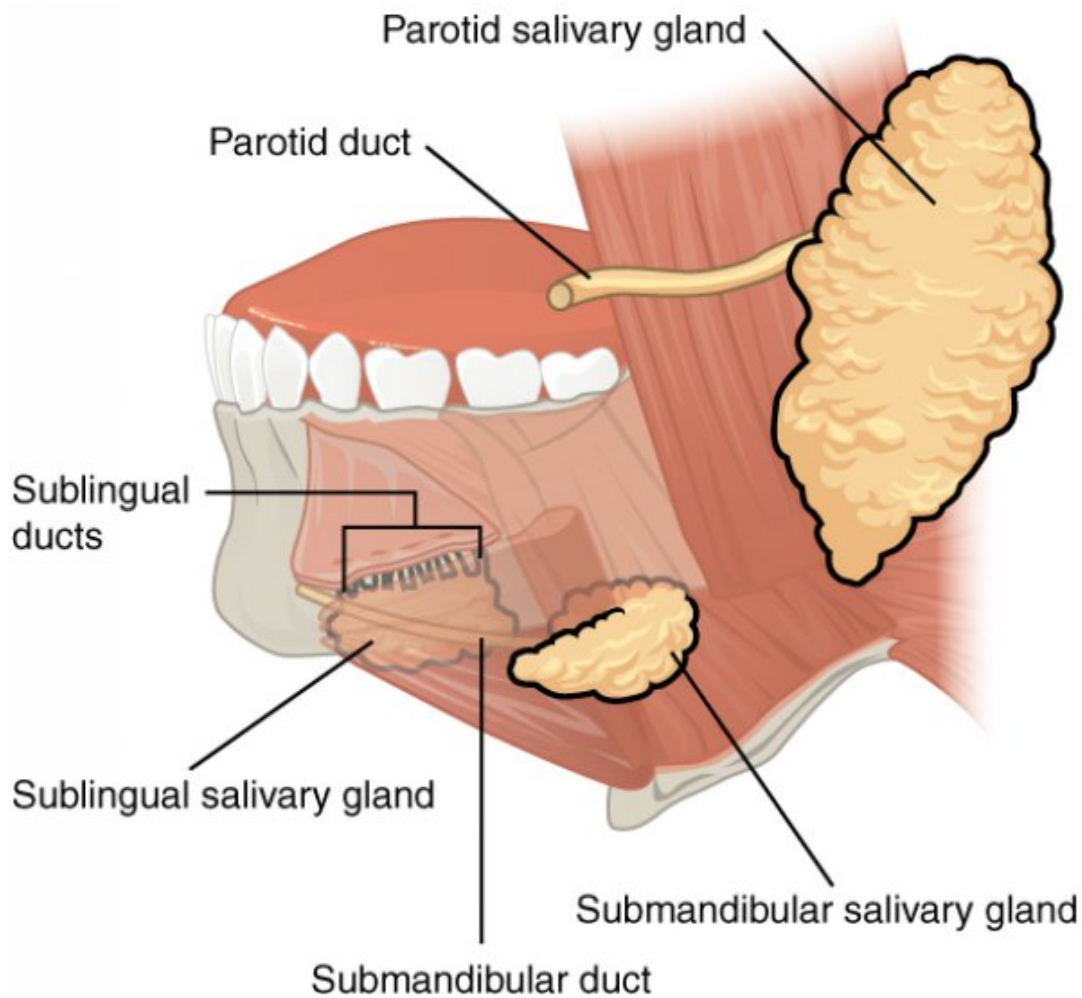


Image: Salivary glands. By Phil Schatz. License: [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

The sublingual gland is the smallest salivary gland and is located under the tongue on the oral diaphragm. The major sublingual duct ends in the sublingual caruncle and originates in the anterior portion of the gland. The shorter minor sublingual ducts lead to the floor of the oral cavity. The facial nerve, which innervates the sublingual and submandibular glands, arises in the superior salivatory nucleus.

The submandibular gland is situated between the digastric muscle and the mandible in the submandibular triangle. The submandibular duct ends in the sublingual caruncle.

Physiology of the salivary glands

The salivary glands produce 0.5–1.5 L of saliva every day. The saliva contains enzymes that play a crucial role in digestion and rinsing of the oral cavity to facilitate swallowing of food.

A frequent subject encountered in examinations relates to the composition of saliva. The saliva secreted by the serous salivary glands is thin and contains many digestive enzymes. The parotid gland is an exclusively serous gland. Mucous glands secrete a slimy fluid with a high degree of viscosity. The mucous secretion is rich in glycoproteins. Both serous and mucous gland cells are present in the sublingual and submandibular glands.

The digestive enzyme alpha-amylase is found in the saliva. It hydrolyzes 1,4-glycosidic bonds in starch. The enzyme is most active at a pH of 6.9. However, it is inactive in the stomach due to its extremely acidic pH. Also, the saliva contains immunoglobulins,

especially IgA, as well as electrolytes such as sodium, potassium, chloride, and others.

Lymphatic System of the Oral Cavity

The processes of breathing and eating constantly transport bacteria into the body. The pharynx is one of the entry points into the body, and is surrounded by lymphatic tissue in the form of tonsils, the so-called Waldeyer's tonsillar ring. The tonsils play a key role in detecting potentially harmful organisms.

Waldeyer's tonsillar ring includes the following:

- Palatine tonsils between the palatal arches
- The lingual tonsil at the root of the tongue
- Tubal tonsils around the orifice of the eustachian tube
- The pharyngeal tonsil in the throat area

Pharynx (Throat)

The pharynx is roughly 5 in. (12 cm) long and extends from the nasal cavity to the esophagus or larynx.

Anatomically, the pharynx is divided into the following:

- The nasopharynx (pars nasalis pharyngis) or epipharynx is the upper portion of the pharynx. Cranially, it is bound by the roof (fornix pharyngis) bearing the pharyngeal tonsil.
- The oropharynx (pars oralis pharyngis) or mesopharynx originates in the isthmus faucium (see above).
- The laryngopharynx (pars laryngea pharyngis) or hypopharynx is the posterior lower portion of the pharynx and is connected to the esophagus.

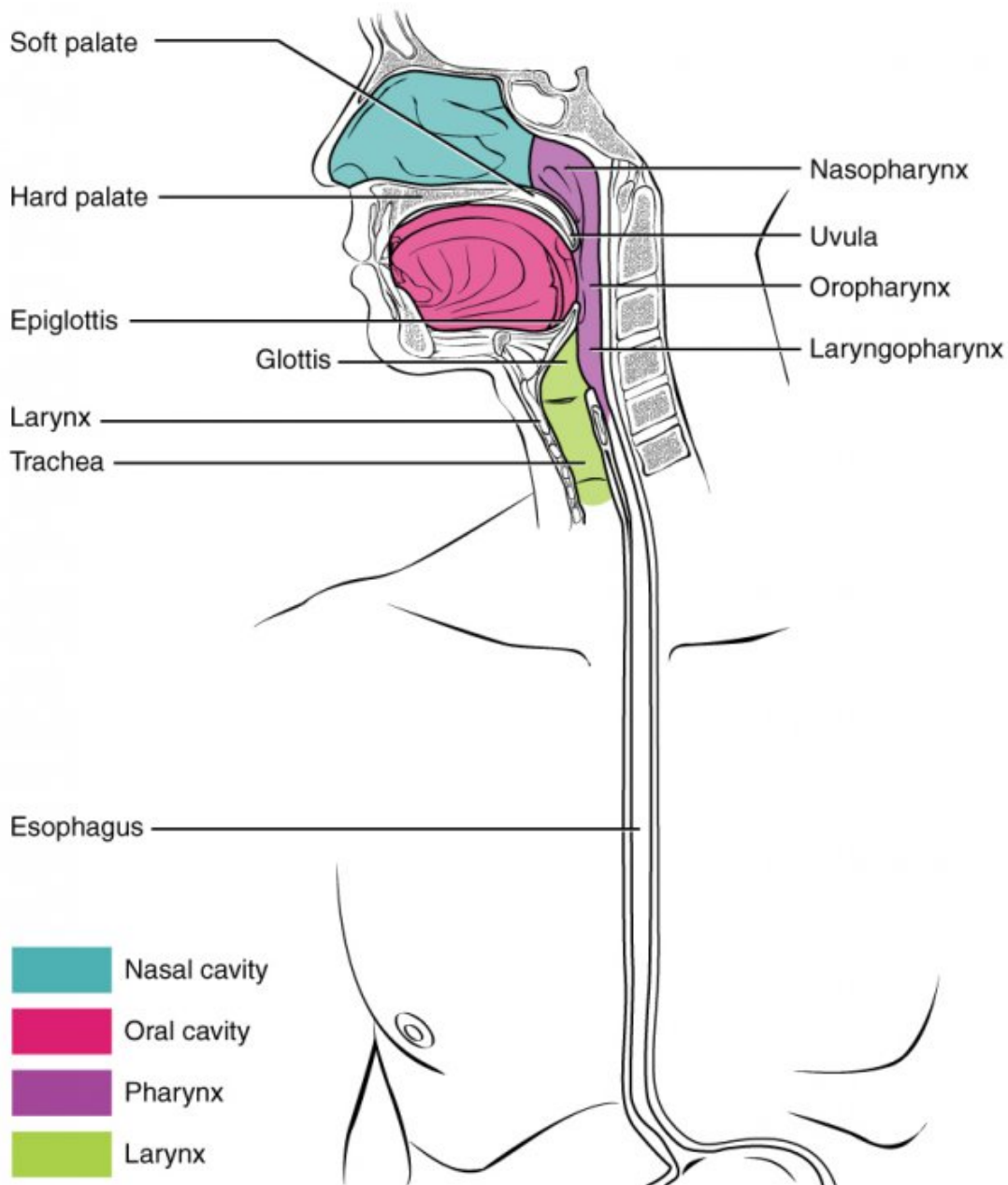


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The coordinated action of several specialized muscle groups facilitates swallowing. In the pharynx, a distinction is made between pharyngeal muscles that constrict (superior, middle, and inferior constrictor muscles) and pharyngeal muscles that shorten and widen the pharynx (palatopharyngeus, stylopharyngeus, salpingopharyngeus, and stylohyoid muscles).

The topography of the pharynx is a popular subject in examinations. Laimer's triangle and Killian's dehiscence are a part of pharyngeal topography. They are anatomically weak spots in the posterior wall of the laryngopharynx. Killian's dehiscence is located between the inferior pharyngeal constrictor muscle and the cricopharyngeus muscle. Laimer's triangle is located under the pars fundiformis, where muscle fibers are scattered in a V-shape. A so-called Zenker's diverticulum is found in the posterior pharyngeal wall.

Clinical manifestations: Severe bad breath (foetor ex ore) may occur due to dental decay. An acidic smell points to hyperacidity of the stomach. A characteristic acetone smell might be noticed in patients with diabetes.

Diseases of the Oral Cavity

Tonsillitis

Tonsillitis refers to the **common inflammation of the palatine tonsil**. In most cases, this inflammation is caused by group A, C, or G beta-hemolytic streptococci. Tonsillitis and pharyngitis are two of the most common reasons for physician consultation. In addition to typical symptoms such as fever and fatigue, tonsillitis can present with swallowing difficulty and lymphadenopathy involving the mandible.

Candida mycosis

Fungal infections of the oral cavity are most frequently caused by *Candida albicans*. The infection normally occurs only during immunosuppression or after antibiotic therapy. Also, patients with diabetes are more susceptible to fungal infections. A typical symptom is a white coating on the tongue.

Oral cancer

Malignant tumors in the oral cavity are mostly squamous cell carcinomas. Risk factors are smoking, chewing tobacco, and regular alcohol consumption. Men carry a roughly eight-fold higher risk of developing malignant oral tumors than women. The oral cavity is easily accessible during an examination. Squamous cell carcinomas can be distinguished easily on the tongue, the gum of the mandible, the lower lip, or on the floor of the mouth, with early manifestation of symptoms.

Pleomorphic adenoma

A pleomorphic adenoma is the **most common tumor of the salivary glands**. Mostly, the parotid gland is affected. A pleomorphic adenoma is a benign tumor and appears individually surrounded by a capsule. Excision is complicated by the anatomic location of the salivary gland, leading to occasional recurrences.

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