NNANNA NANCY CHINEMEREM

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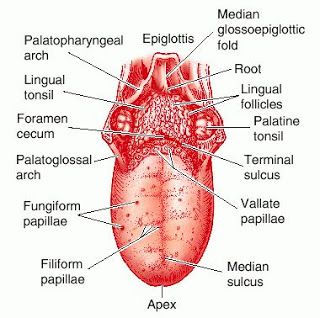
MEDICINE AND SURGERY 300 LEVEL

1. **Anatomy of the tongue and comment on its applied anatomy.**

The tongue is a muscular organ in the mouth. The tongue is covered with moist, pink tissue called mucosa. Tiny bumps called papillae give the tongue its rough texture. Thousands of taste buds cover the surfaces of the papillae. Taste buds are collections of nerve-like cells that connect to nerves running into the brain.

The tongue is anchored to the mouth by webs of tough tissue and mucosa. The tether holding down the front of the tongue is called the frenum. In the back of the mouth, the tongue is anchored into the hyoid bone. The tongue is vital for chewing and swallowing food, as well as for speech.

The four common tastes are sweet, sour, bitter, and salty. A fifth taste, called umami, results from tasting glutamate (present in MSG). The tongue has many nerves that help detect and transmit taste signals to the brain.

[](https://www.google.com/url?sa=i&url=https://www.pinterest.com/pin/354165958169258214/&psig=AOvVaw1sA0q_ZUTvtjP1zq22NAXG&ust=1588242942296000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCOCujLOjjukCFQAAAAAdAAAAABAD)

**Tongue (Lingua)**

The world is riddled with numerous stimuli that living organisms interact with every day. Each individual is able to perceive, process, and integrate these stimuli with the aid of general and specialized sensory receptors throughout the body. The tongue is a unique organ located in the [oral cavity](https://www.kenhub.com/en/library/anatomy/the-oral-cavity) that not only facilitates perception of gustatory stimuli but also plays important roles in mastication and deglutition. Additionally, the tongue is an integral component of the speech pathway, as it helps with articulation.

Therefore, the name glossopharyngeus refers to the muscle arising from the tongue and inserting in the [pharynx](https://www.kenhub.com/en/library/anatomy/the-pharynx). Similarly, the name hyoglossus speaks of a muscle originating at the [hyoid bone](https://www.kenhub.com/en/library/anatomy/hyoid-bone) and inserting in the tongue.

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| --- | --- |
| **Key facts about the tongue** | |
| **Embryology** | **Starting with day 23** |
| **Parts** | Tip (apex), body, base |
| **Surfaces** | Dorsal (superior) and ventral (inferior) |
| **Relations** | Anterior and lateral - teeth  Superior - hard and soft palates  Inferior - mucosa of the floor of the oral cavity, sublingual salivary glands, posterior wall of oropharynx  Posterior - epiglottis, pharyngeal inlet  Lateral - palatoglossal and palatopharyngeal arches |
| **Muscles** | Intrinsic - superior longitudinal, vertical, transverse, inferior longitudinal muscles  Extrinsic -  genioglossus, hypoglossus, styloglossus, palatoglossus muscles |
| **Blood Supply** | Lingual artery (dorsal lingual, sublingual, deep lingual arteries), ascending palatine, tonsillar, ascending pharyngeal arteries |
| **Lymphatics** | Marginal, central, dorsal, submandibular, jugulo-omohyoid, deep cervical lymph nodes |
| **Innervation** | Hypoglossal nerve, pharyngeal plexus, lingual nerve, glossopharyngeal nerve, facial nerve, vagus nerve, chorda tympani |
| **Mucosa** | Stratified squamous keratinized (dorsal surface) and non-keratinized (ventral surface) epithelia |
| **Lingual Papillae** | Filiform, fungiform, foliate, circumvallate |
| **Taste Buds** | Stratified squamous epithelium  Structure - gustatory cells, supportive cells, basal stem cells, taste pore |

Another important point to note is that the tongue is embryologically divided into an anterior and a posterior part. The anterior part of the tongue is also called the oral or presulcal part of the tongue. Conversely, the posterior part of the tongue is referred to as the pharyngeal or postsulcal part of the tongue. Lastly, avoid interchanging the words root and base when discussing the tongue, as these represent two anatomically distinct areas. The base of the tongue refers to the postsulcal part that forms the ventral wall of the oropharynx, while the root of the tongue refers to a part of the presulcal tongue that is attached to the floor of the oral cavity.

**Contents**

apparatus has been identified as the main embryological structure that gives rise to numerous components of the [head and neck region](https://www.kenhub.com/en/library/anatomy/regions-of-the-head-and-neck). It is divided into [arches](https://www.kenhub.com/en/library/anatomy/the-pharyngeal-arches), [pouches, and clefts](https://www.kenhub.com/en/library/anatomy/the-pharyngeal-pouches-membranes-and-clefts), which fuse and reshape throughout early development to give the adult structures of the head and neck. The apparatus begins to form around day 23 of embryonic development.

By day 28, the pharyngeal apparatus is almost fully formed and subsequently begins to transition into definitive head and neck structures. This is preceded by the formation of the stomodeum (primitive mouth) and rupture of the oropharyngeal membrane (a double-layered membrane that separates the stomodeum from the primitive pharynx); thus allowing communication of the foregut with the amniotic cavity (occurring around day 26). Within the pouches of pharyngeal apparatus are neurovascular bundles and mesenchymal tissue that develop into the nerves and blood vessels, and bones and muscles (respectively) within the region.

**Anterior two thirds**

The tongue is one of those structures derived from the pharyngeal apparatus. Towards the end of the fourth gestational week,  the mesenchyme of the ventromedial aspect of the first pharyngeal arches begins to proliferate in the floor of the primitive pharynx to form the median lingual swelling (tuberculum impar). This triangular protuberance is located cranial to the foramen cecum (opening of the thyroglossal duct) and is later joined by the two distal tongue buds (lateral lingual swellings). The lateral lingual swellings are oval enlargements arising on either side of the median lingual swelling. The rate of growth of the lateral lingual swellings exceeds that of the median lingual swelling.

By the 5th to 6th gestational week, they outgrow the median lingual swelling and fuse in the midline to form the oral part of the tongue. The fibrous lingual septum represents the point of fusion of the two lateral lingual swellings, which lies deep to the midline groove (a central groove along the longitudinal axis) of the tongue.

**Structures at the level of the tongue.**

**Posterior third**

Caudal to the foramen cecum, two mesenchymal derivatives arise from the ventromedial part of the second to fourth pharyngeal arches. The copula linguae are the product of the second pharyngeal arches, while the hypopharyngeal eminence – which develops below the copula – arises from the third and fourth pharyngeal arches. Like the lateral lingual swellings, the hypopharyngeal eminences grow at a faster rate than the copula. As a result, the copula regresses between the 4th and 5th week of development and the hypopharyngeal eminence becomes the pharyngeal part of the tongue.

The oral and pharyngeal part of the tongue eventually fuses, forming a V-shaped junction known as the sulcus terminalis. While the [connective tissue](https://www.kenhub.com/en/library/anatomy/loose-connective-tissue) and vascular supply of the tongue mostly originate from the preceding pharyngeal arches, the intrinsic and extrinsic muscles are myoblast derivatives originating from the occipital [myotomes](https://www.kenhub.com/en/library/anatomy/myotomes).

Also, the tongue and the [hard palate](https://www.kenhub.com/en/library/anatomy/hard-palate) develop simultaneously. It contributes to molding the palate into the arched structure that it eventually becomes during postnatal life. Most of the morphological changes of the tongue occur during the first trimester of pregnancy. By the second trimester and into extrauterine life, the rest of the changes are related to elongation and repositioning of the organ. Both the presulcal and postsulcal parts of the tongue are within the oral cavity proper at birth. Caudal migration of the posterior third of the tongue is not completed until the age of 4 years.

**Taste buds and papillae**

The coarse texture of the dorsal surface of the tongue can be attributed to the numerous lingual papillae that are found on its surface. As the 8th gestational week draws to a close, foliate and vallate papillae are the first of the four papillae to develop. These are followed by the appearance of fungiform papillae. By the 10th – 11th week of gestation, the thread-like filiform papillae can be observed on the dorsal surface of the tongue. Each type of papillae has a particular role in tongue physiology, and as such, has a unique innervation based on the nerve endings they developed closest to.

The development of taste buds begins as the last of the papillae are formed in the 11th week of gestation. Their formation is influenced by the invading special sensory nerve fibers, as well as inductive factors from the surrounding [epithelium](https://www.kenhub.com/en/library/anatomy/overview-and-types-of-epithelial-tissue). Although the majority of these specialized gustatory receptors will develop on the dorsum of the tongue, they also arise on the hard and [soft palates](https://www.kenhub.com/en/library/anatomy/the-soft-palate), dorsum of the [epiglottis](https://www.kenhub.com/en/library/anatomy/epiglottis), palatoglossal arches, and the posterior oropharyngeal wall. Taste bud development is concluded around the 13th gestational week.

**Nerve supply**

Owing to the fact that each pharyngeal arch has its own neurovascular bundle, the derivatives of these pouches will also take their nerve supply from these sources as well. The [mandibular division](https://www.kenhub.com/en/library/anatomy/the-mandibular-branch-of-the-trigeminal-nerve) of the [trigeminal nerve (CN V3)](https://www.kenhub.com/en/library/anatomy/the-trigeminal-nerve) carries sensory impulses arising from the derivatives of the first pharyngeal arch. Since this arch gave rise to the tuberculum impar and lateral lingual swellings (which forms the oral part of the tongue), the mucosa of this entire area sends afferent impulses via the lingual branch of CN V3.

Even though the second pharyngeal arch does not contribute to a visible structure on the surface of the tongue, a part of its nerve supply – the chorda tympani; a branch of the [facial nerve (CN VII)](https://www.kenhub.com/en/library/anatomy/facial-nerve) – carries special afferent signals from the taste buds (excluding vallate papillae) of the presulcal part of the tongue. The vallate papillae, along with the mucosa of the postsulcal part of the tongue, pass afferent stimuli to the [glossopharyngeal nerve (CN IX)](https://www.kenhub.com/en/library/anatomy/the-glossopharyngeal-nerve); which is the nerve of the third pharyngeal arch. This innervation is also supplemented by the nerve of the fourth pharyngeal arch – the [vagus nerve (CN X)](https://www.kenhub.com/en/library/anatomy/the-vagus-nerve) – which carries sensory stimuli from the base of the tongue that is anterior to the epiglottis.

**Arteries, veins and nerves of the tongue.**

both intrinsic and extrinsic [muscles of the tongue](https://www.kenhub.com/en/library/anatomy/muscles-and-taste-sensation-of-the-tongue) arise from occipital myotomes that migrated ventrally to populate the developing tongue. As a result, the migrating myocytes took the [hypoglossal nerve (CN XII)](https://www.kenhub.com/en/library/anatomy/the-hypoglossal-nerve) along with it. Therefore, CN XII provides efferent stimuli to all the muscles of the tongue. The exception to this rule is palatoglossus, which derives its motor supply from the pharyngeal plexus.

Development of the tongue begins toward the end of the fourth gestational week.

The anterior two-thirds of the organ is known as the presulcal (oral) part, and the posterior third is the postsulcal (pharyngeal) part.

The presulcal tongue originates from the first pharyngeal arch, while the postsulcal part arises from the third and fourth pharyngeal arches.

Neither the tuberculum impar (from 1st pharyngeal arch) nor the copula (2nd pharyngeal arch) contributes to structures of the adult tongue.

The presulcal tongue has lingual papillae and taste buds, while the postsulcal part has lingual tonsils and taste buds.

Innervation of the tongue is dependent on the pharyngeal arch that the area was derived from.

**Anatomy**

Under normal circumstances, the tongue is a pink, muscular organ located within the oral cavity proper. It is kept moist by the products of the major and minor [salivary glands](https://www.kenhub.com/en/library/anatomy/the-salivary-glands), which aids the organ as it facilitates deglutition, speech, and gustatory perception. While there is significant variability in the length of the tongue among individuals, on average, the organ is roughly 10 cm long. It has three main parts:

The tip or apex of the tongue is the most anterior, and most mobile aspect of the organ.

The tip is followed by the body of the tongue. It has a rough dorsal (superior) surface that abuts the palate and is populated with taste buds and lingual papillae, and a smooth ventral (inferior) surface that is attached to the floor of the oral cavity by the lingual frenulum.

The base of the tongue is the most posterior part of the organ. It is populated by numerous lymphoid aggregates known as the lingual tonsils along with foliate papillae along the posterolateral surface.

**Overview of the structure of the tongue (superior view**)

There are numerous important structures surrounding the tongue. It is limited anteriorly and laterally by the upper and lower rows of [teeth](https://www.kenhub.com/en/library/anatomy/the-teeth). Superiorly, it is bordered by the hard (anterior part) and soft (posterior part) palates. Inferiorly, the root of the tongue is continuous with the mucosa of the floor of the oral cavity; with the sublingual salivary glands and vascular bundles being located below the mucosa of the floor of the oral cavity.

The palatoglossal and palatopharyngeal arches (along with the [palatine tonsils](https://www.kenhub.com/en/library/anatomy/tonsils)) have lateral relations to the posterior third of the tongue. Posterior to the base of the tongue is the dorsal surface of the epiglottis and laryngeal inlet, and the posterior wall of the oropharynx. As mentioned earlier, the presulcal and postsulcal parts of the tongue differ not only by anatomical location, but also based on embryological origin, innervation, and the type of mucosa found on its surface.

**Overview of the structure of the tongue seen from the cranial view of the dorsum.**

**Anterior two thirds**

The presulcal tongue includes the apex and body of the organ. It terminates at the sulcus terminalis; which can be seen extending laterally in an oblique direction from the foramen cecum towards the palatoglossal arch. The mucosa of the dorsal surface of the oral tongue is made up of circumvallate, filiform, and fungiform papillae. There is also a longitudinal midline groove running in an anteroposterior direction from the tip of the tongue to the foramen cecum. This marks the embryological point of fusion of the lateral lingual swellings that formed the oral tongue. It also represents the location of the median lingual (fibrous) septum of the tongue that inserts in the body of the [hyoid bone](https://www.kenhub.com/en/library/anatomy/hyoid-bone).

**superior view**

**Terminal sulcus of tongue (Sulcus terminalis linguae**)

On the lateral surface of the oral tongue are foliate papillae arranged as a series of vertical folds. The ventral mucosa of the oral tongue is comparatively unremarkable. It is smooth and continuous with the mucosa of the floor of the mouth and the inferior gingiva. The lingual veins are relatively superficial and can be appreciated on either side of the lingual frenulum. Lateral to the lingual veins are pleated folds of mucosa known as the plica fimbriata. They are angled anteromedially toward the apex of the tongue.

**Posterior third**

The remainder of the tongue that lies posterior to the sulcus terminalis is made up by the base of the organ. It lies behind the palatoglossal folds and functions as the anterior wall of the oropharynx. Unlike the oral tongue, the pharyngeal tongue does not have any lingual papillae. Instead, its mucosa is populated by aggregates of lymphatic tissue known as the lingual tonsils. The mucosa is also continuous with the mucosa of the laterally located palatine tonsils, the lateral oropharyngeal walls, and the posterior epiglottis and glossoepiglottic folds.

**Lingual tonsil (superior view)**

**Muscles**

The tongue is chiefly a muscular organ with some amount of fatty and fibrous tissue distributed throughout its substance. All the muscles of the tongue are paired structures, with each copy being found on either side of the median fibrous septum. There are muscles that extend outside of the organ to anchor it to surrounding bony structures, known as extrinsic muscles. The other set of muscles are confined to each half of the organ and contribute to altering the shape of the organ; these are the intrinsic muscles.

**Intrinsic tongue muscles**

The intrinsic tongue muscles are responsible for adjusting the shape and orientation of the organ. It is made up of four paired muscles, which are discussed below in a dorsoventral manner.

The superior longitudinal muscles are made up of a thin layer of muscle fibers traveling in a mixture of oblique and longitudinal axes just deep to the superior mucosal surface of the organ. These fibers arise from the median fibrous septum as well as the fibrous layer of submucosa from the level of the epiglottis. They eventually insert along the lateral and apical margins of the organ. These muscles are responsible for retracting and broadening the tongue, as well as elevating the tip of the tongue. The net effect of these muscles results in shortening of the organ.

Another set of muscles occupy the dorsoventral plane of the tongue deep to the superior longitudinal muscles. These are the vertical muscles that arise from the root of the organ and genioglossus muscle and insert into the median fibrous septum, along the entire length of the organ. These muscles facilitate flattening and widening of the tongue.

**Intrinsic Muscles**

The **intrinsic** muscles only attach to other structures in the tongue. There are four paired intrinsic muscles of the tongue and they are named by the direction in which they travel: the**superior longitudinal, inferior longitudinal, transverse** and **vertical** muscles of the tongue. These muscles affect the shape and size of the tongue – for example, in tongue rolling – and have a role in facilitating speech, eating and swallowing.

Motor innervation for the intrinsic muscles of the tongue is via the [hypoglossal nerve](https://teachmeanatomy.info/head/cranial-nerves/hypoglossal/) (CNXII).

**Extrinsic Muscles**

The **extrinsic** muscles are as follows:

**Genioglossus**

* Attachments: Arises from the mandibular symphsis. Inserts into the body of the hyoid bone and the entire length of the tongue.
* Function: Inferior fibres protrude the tongue, middle fibres depress the tongue, and superior fibres draw the tip back and down
* Innervation: Motor innervation via the [hypoglossal nerve](https://teachmeanatomy.info/head/cranial-nerves/hypoglossal/) (CNXII).

**Hyoglossus**

* **Attachments:** Arises from the hyoid bone and inserts into the side of the tongue
* **Function:** Depresses and retracts the tongue
* **Innervation**: Motor innervation via the [hypoglossal nerve](https://teachmeanatomy.info/head/cranial-nerves/hypoglossal/) (CNXII).

**Styloglossus**

* **Attachments:** Originates at the styloid process of the temporal bone and inserts into the side of the tongue
* **Function**: Retracts and elevates the tongue
* **Innervation**: Motor innervation via the [hypoglossal nerve](https://teachmeanatomy.info/head/cranial-nerves/hypoglossal/) (CNXII).

**Palatoglossus**

* Attachments: Arises from the palatine aponeurosis and inserts broadly across the tongue
* Function: Elevates the posterior aspect of the tongue
* Innervation: Motor innervation via the [vagus nerve](https://teachmeanatomy.info/head/cranial-nerves/vagus-nerve-cn-x/) (CNX).

All of the intrinsic and extrinsic muscles are innervated by the [hypoglossal nerve](https://teachmeanatomy.info/head/cranial-nerves/hypoglossal/) (CN XII), except palatoglossus, which has [vagal](https://teachmeanatomy.info/head/cranial-nerves/vagus-nerve-cn-x/) innervation (CN X).

– The extrinsic muscles of the tongue. Note the palatoglossus muscle is not included in this illustration.

**Innervation**

The lingual nerve provides sensory innervation to the to the 2/3 of the tongue.

In the anterior 2/3, general sensation is supplied by the [**trigeminal nerve**](https://teachmeanatomy.info/head/cranial-nerves/trigeminal-nerve/) (CNV). Specifically the **lingual nerve**, a branch of the **mandibular nerve**(CN V3).

On the other hand, taste in the anterior 2/3 is supplied from the [**facial nerve**](https://teachmeanatomy.info/head/cranial-nerves/facial-nerve/) (CNVII). In the petrous part of the [temporal bone](https://teachmeanatomy.info/head/osteology/temporal-bone/), the [facial nerve](https://teachmeanatomy.info/head/cranial-nerves/facial-nerve/) gives off three branches, one of which is **chorda tympani**. This travels through the [middle ear](https://teachmeanatomy.info/head/organs/ear/middle-ear/), and continues on to the tongue.

The posterior 1/3 of the tongue is slightly easier. Both touch and taste are supplied by the [**glossopharyngeal** **nerve**](https://teachmeanatomy.info/head/cranial-nerves/glossopharyngeal-nerve/) (CNIX).

**Vasculature**

The **lingual** **artery** (branch of the external carotid) does most of the supply, but there is a branch from the facial artery, called the **tonsillar artery**, which can provide some collateral circulation. Drainage is by the **lingual** **vein**.

**Lymphatic Drainage**

The lymphatic drainage of the tongue is as follows:

* **Anterior two thirds** – initially into the submental and submandibular nodes, which empty into the deep cervical lymph nodes
* **Posterior third** – directly into the deep cervical lymph nodes

**Clinical Relevance -**

**– Tongue tied**

The tongue is attached anteroinferiorly by a piece of connective tissue called the **frenulum,**which lies in the midline. The process by which the frenulum is formed is the same by which your fingers are made, and is known as sculpting apoptosis. Just as some people may have webbed fingers if this process fails, it can result in excess frenulum. This is called being ‘**tongue-tied**’, and presents in children. There are varying degrees of severity of tongue-tie and in some cases it can restrict the movement of the tongue causing difficulties with breast feeding. This can be managed with simple surgery

**Superior longitudinal muscle of tongue (Musculus longitudinalis superior linguae**)

Deep to the ventral muscles is the layer of transverse muscles of the tongue. They take a lateral route, extending from either side of the medial lingual septum (origin) to the fibrous submucosa along the lateral margins of the tongue (insertion). As these muscles contract, they cause the tongue to narrow and elongate.

Finally, the inferior longitudinal muscles travel above the ventral submucosa of the tongue. These fibers travel between hyoglossus and genioglossus as it arises from the base of the tongue and body of the hyoid bone. The fibers end in the apex of the tongue; allowing the muscle to pull the tip of the tongue inferiorly and also shortening the organ.

The intrinsic tongue muscles can operate independently, or in combination with each other to give rise to numerous shapes. This is an important feature of the tongue as it facilitates molding of the food particles into a bolus in preparation for deglutition and speech.

**Arteries**

The vascular supply to the tongue muscles is provided by derivatives of the [lingual artery](https://www.kenhub.com/en/library/anatomy/lingual-artery). This is a branch of the [external carotid artery](https://www.kenhub.com/en/library/anatomy/the-external-carotid-artery-and-its-branches) that traverses the region between the [middle pharyngeal constrictor](https://www.kenhub.com/en/library/anatomy/middle-pharyngeal-constrictor) and hyoglossus in order to access the floor of the mouth. It takes a sharp superior turn at the anterior border of hyoglossus as it travels alongside CN IX. Of note, the tongue has good collateral supply as the lingual artery also anastomosis with the contralateral vessel. The named branches of the lingual artery are as follows:

The dorsal lingual arteries are relatively small derivatives of the lingual artery that arise medial to hyoglossus. In addition to supplying the dorsal mucosa of the tongue, it also gives branches to the palatoglossus, soft palate, palatine tonsils, and epiglottis.

Emerging at the anterior limit of the hyoglossus, the sublingual arteries course between the [mylohyoid](https://www.kenhub.com/en/library/anatomy/mylohyoid-muscle) and genioglossus as it travels towards the sublingual glands in the floor of the oral cavity. As it arborizes, one of its branches anastomoses with the submental branches of the [facial artery](https://www.kenhub.com/en/library/anatomy/facial-artery), while another traverses the gingiva of the [mandible](https://www.kenhub.com/en/library/anatomy/the-mandible) to anastomose with the analogous contralateral vessel.

As the lingual artery terminates near the lingual frenulum on the ventral surface of the tongue, it is referred to as the deep lingual artery.

The lingual artery is supported by other branches of the external carotid artery. The facial artery gives off the ascending palatine and tonsillar arteries that also supply the tongue. The [ascending pharyngeal branch](https://www.kenhub.com/en/library/anatomy/ascending-pharyngeal-artery) of the external carotid artery also supplies the organ.

**Veins**

The veins of the tongue are named similarly to the arteries that they accompany. They are formed from numerous venous tributaries that eventually coalesce. As the deep lingual vein forms adjacent to the apex of the tongue, it courses along the ventral surface of the tongue (deep to the mucosa).  As the deep lingual vein anastomosis with the sublingual vein, they become the vena comitans of CN XII. This venous network eventually drains to the lingual vein that later join the facial or the anterior division of the retromandibular veins. Here, they form the common facial vein, which is a tributary to the internal jugular vein. Alternatively, the venae comitantes may drain directly to the internal jugular vein.

The dorsal lingual veins are responsible for draining the lateral margins and dorsal surface of the tongue. They travel alongside the similarly named artery as they drain into the internal jugular vein.

**Tongue Conditions**

* [**Thrush**](https://www.webmd.com/oral-health/guide/dental-health-thrush) **(candidiasis):** *Candida albicans* (a yeast) grows over the surface of the mouth and tongue. Thrush can occur in almost anyone, but it occurs more often in people taking steroids or with suppressed immune systems, the very young, and the elderly.
* [**Oral cancer**](https://www.webmd.com/oral-health/guide/oral-cancer): A growth or ulcer appears on the tongue and grows steadily. Oral cancer is more common in people who smoke and/or drink alcohol heavily.
* **Macroglossia (big tongue**): This can be broken down into various categories based on the cause. These include congenital, inflammatory, traumatic, cancerous, and metabolic causes. Thyroid disease, lymphangiomas, and congenital abnormalities are among some of the causes of an enlarged tongue.
* [**Geographic tongue**](https://www.webmd.com/oral-health/tongue-problem-basics-sore-or-discolored-tongue-and-tongue-bumps)**:** Ridges and colored spots migrate over the surface of the tongue, periodically changing its appearance. Geographic tongue is a harmless condition.
* [**Burning mouth/burning tongue syndrome**](https://www.webmd.com/oral-health/burning-mouth-syndrome-mefref)**:** a relatively common problem. The tongue feels burned or scalded, or strange tastes or sensations develop. Apparently harmless, burning mouth syndrome may be caused by a mild nerve problem.
* Atrophic glossitis (bald tongue): The tongue loses its bumpy texture, becoming smooth. Sometimes this is due to anemia or a B vitamin deficiency.
* [**Canker sores**](https://www.webmd.com/oral-health/guide/canker-sores) **(aphthous ulcers):** Small, painful ulcers appear periodically on the tongue or mouth. A relatively common condition, the cause of canker sores is unknown; they are unrelated to the cold sores caused by herpes viruses. Canker sores are not contagious.
* [**Oral leukoplakia**](https://www.webmd.com/oral-health/guide/dental-health-leukoplakia): White patches appear on the tongue that can’t be scraped off. Leukoplakia may be benign, or it can progress to oral cancer.
* [**Hairy tongue**](https://www.webmd.com/oral-health/black-hairy-tongue)**:** Papillae can overgrow the surface of the tongue, giving it a white or black appearance. Scraping off the papillae corrects this harmless condition.
* [**Herpes stomatitis**](https://www.webmd.com/a-to-z-guides/understanding-cold-sores-basics)**:** The herpes virus can uncommonly cause cold sores on the tongue. Herpes virus cold sores are usually on the lip.
* [**Lichen planus**](https://www.webmd.com/skin-problems-and-treatments/lichen-planus)**:** A harmless condition that can affect the skin or the mouth. The cause is unknown; however, it is believed to be caused by the immune system attacking the skin and lining of the mouth.

**Tongue Tests**

* [Biopsy](https://www.webmd.com/cancer/tc/oral-cavity-cancer-lip-and-oral-cavity-cancer-screening-health-professional-information-nci-13486): A small sample of tissue is taken from a suspicious-looking area on the tongue. This is most often done to check for oral cancer.
* Flavor discrimination test: Four solutions of different amounts of sweetener are used to evaluate taste and smell.

Continue Reading Below

**Tongue Treatments**

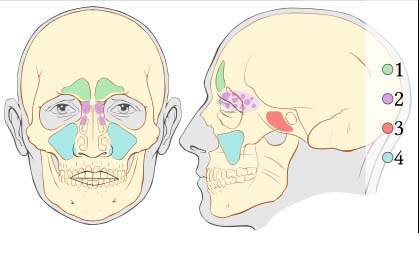
* [**Steroid gel**](https://www.webmd.com/drugs/mono-719-FLUOCINONIDE+-+TOPICAL.aspx?drugid=3786&drugname=Lidex+Top): Applying a prescription steroid gel like Lidex hastens the resolution of canker sores.
* [**Silver nitrate**](https://www.webmd.com/drugs/search.aspx?stype=drug&source=1&query=Silver%20nitrate)**:** Doctors can apply this chemical to a canker sore, speeding healing and relieving pain.
* [**Viscous lidocaine**](http://www.webmd.com/drugs/mono-9170-LIDOCAINE+-+TOPICAL.aspx?drugid=8532&drugname=Lidocaine+Top)**:** Applied to the tongue, lidocaine gel provides immediate, though temporary, pain relief.
* [**Antifungal medicines**](https://www.webmd.com/oral-health/tc/thrush-medications)**:** Antifungal drugs can eliminate *Candida albicans*, the thrush-causing fungus. Swish-and-spit mouthwash and pills are both effective.
* [**Tongue scraping**](https://www.webmd.com/oral-health/black-hairy-tongue): Simply scraping the tongue can usually remove the overgrown papillae causing black or white hairy tongue.
* [**B vitamins**](https://www.webmd.com/drugs/drug-3387-Vitamin+B+Complex+Oral.aspx?drugid=3387&drugname=Vitamin+B+Complex+Oral)**:** A B vitamin supplement can correct a vitamin deficiency, if present.
* [**Tongue surgery**](http://www.webmd.com/cancer/tc/oral-cavity-cancer-lip-and-oral-cavity-cancer-treatment-health-professional-information-nci-12316)**:** Surgery may be required to remove oral cancer or leukoplakia.

1. **AIR SINUSES**

The paranasal sinuses are air-filled **extensions** of the respiratory part of the nasal cavity. There are **four** paired sinuses, named according to the bone in which they are located; maxillary, frontal, sphenoid and ethmoid.

The function of the sinuses is not clear. It is thought that they may contribute to the **humidifying**of the inspired air. They also reduce the weight of the skull.

Sinuses are formed in childhood by the nasal cavity **eroding** into surrounding bone. As they are outgrowths of the nasal cavity, they all drain back into it – **openings** to the paranasal sinuses are found on the **roof** and **lateral** walls of the nasal cavity. The inner surface is lined by a respiratory mucosa.

[](https://teachmeanatomy.info/wp-content/uploads/2013/02/location-of-paranasal-sinuses.jpg)

1 – Diagram showing the location of the paranasal sinuses.1 – Frontal sinuses2 – Ethmoid sinuses3 – Sphenoid sinuses4 – Maxillary sinuses

**Frontal Sinuses**: These are the most **superior** in location, found under the forehead. The frontal sinuses are variable in size, but always triangular-shaped. They drain into the nasal cavity via the **frontonasal duct**, which opens out at the hiatus semilunaris on the lateral wall.

**Sphenoid Sinuses**:  The sphenoid sinuses also lie relatively superiorly, at the level of the spheno-ethmodial recess.  They are found more **posteriorly**, and are related superiorly and laterally to the **cranial cavity**. The sphenoid sinuses drain out onto the roof of the nasal cavity.  The relationships of this sinus are of clinical importance – the **pituitary gland** can be surgically accessed via passing through the nasal roof, into the sphenoid sinus and through the sphenoid bone.

**Ethmoidal Sinuses**: There are three ethmoidal sinuses; anterior, middle and posterior. They empty into the nasal cavity at different places:

* Anterior – Hiatus semilunaris
* Middle – Ethmoid bulla
* Posterior – Superior meatus

**Maxillary Sinuses:**The largest of the sinuses. It is located laterally and slightly **inferiorly** to the nasal cavities. It drains into the nasal cavity at the **hiatus semilunaris,** underneath the **frontal sinus** opening. This is a potential pathway for spread of infection – fluid draining from the frontal sinus can enter the maxillary sinus.

**Clinical Relevance: Sinusitis**

As the paranasal sinuses are continuous with the nasal cavity, an upper respiratory tract **infection** can **spread** to the sinuses. Infection of the sinuses causes inflammation (particularly pain and swelling) of the mucosa, and is known as sinusitis. If more than one sinus is affected, it is called **pansinusitis**.

The **maxillary nerve** supplies both the maxillary sinus and maxillary teeth, and so inflammation of that sinus can present with **toothache**.

**Sinus Conditions**

[**Acute sinusitis**](https://www.webmd.com/a-to-z-guides/sinus-infection) **(**[**sinus infection**](https://www.webmd.com/webmd/consumer_assets/editorial/articles/health_and_medical_reference/allergies/miscellaneous/allergies_sinusitis.xml)**):** Viruses, bacteria, or fungi infect the sinus cavity, causing [inflammation](https://www.webmd.com/arthritis/about-inflammation). More mucus; nasal congestion; discomfort in the cheeks, forehead, or around the [eyes](https://www.webmd.com/eye-health/ss/slideshow-eye-conditions-overview); and [headaches](https://www.webmd.com/migraines-headaches/default.htm) are common symptoms.

[**Chronic sinusitis**](https://www.webmd.com/allergies/guide/allergies-sinusitis) **(or chronic rhinosinusitis):** More than just a series of infections, chronic [sinusitis](https://www.webmd.com/allergies/ss/slideshow-sinusitis) is a persistent process of [inflammation](https://www.webmd.com/women/ss/slideshow-what-is-inflammation) of the sinuses.

[**Deviated septum**](https://www.webmd.com/a-to-z-guides/repair-of-a-deviated-septum-septoplasty-surgery-overview) **:** If the septum that divides the nose is too far too one side, airflow can be blocked.

[**Hay fever**](https://www.webmd.com/allergies/ss/slideshow-allergy-attack) **(** [**allergic rhinitis**](https://www.webmd.com/allergies/guide/rhinitis) **):** Allergens like [pollen](https://www.webmd.com/allergies/pollen_allergies_overview), [dust mites](https://www.webmd.com/allergies/dust-mite-mattress-and-pillow-covers-for-allergy-relief), and pet dander cause the defenses in the nose and sinuses to overreact. Mucus, nasal stuffiness, [sneezing](https://www.webmd.com/allergies/features/11-surprising-sneezing-facts), and [itching](https://www.webmd.com/skin-problems-and-treatments/guide/skin-conditions-pruritus) result.

[**Nasal polyps**](https://www.webmd.com/allergies/guide/nasal-polyps-symptoms-and-treatments) aresmall growths in the nasal cavity. They can happen due to inflammation from [asthma](https://www.webmd.com/asthma/default.htm), chronic sinus infections, and [nasal allergies](https://www.webmd.com/allergies/rhinitis) (such as [hay fever](https://www.webmd.com/allergies/allergies-assessment/default.htm)).

**Turbinate hypertrophy:** The ridges on the nasal septum are enlarged, which can block airflow.

***Sinus Tests***

[**Physical examination**](https://www.webmd.com/a-to-z-guides/sinusitis-exams-and-tests) **:** A doctor can look into the nose with a lighted viewer to see the turbinates, which may be swollen. She may press or tap on the face over the sinuses to check for pain.