

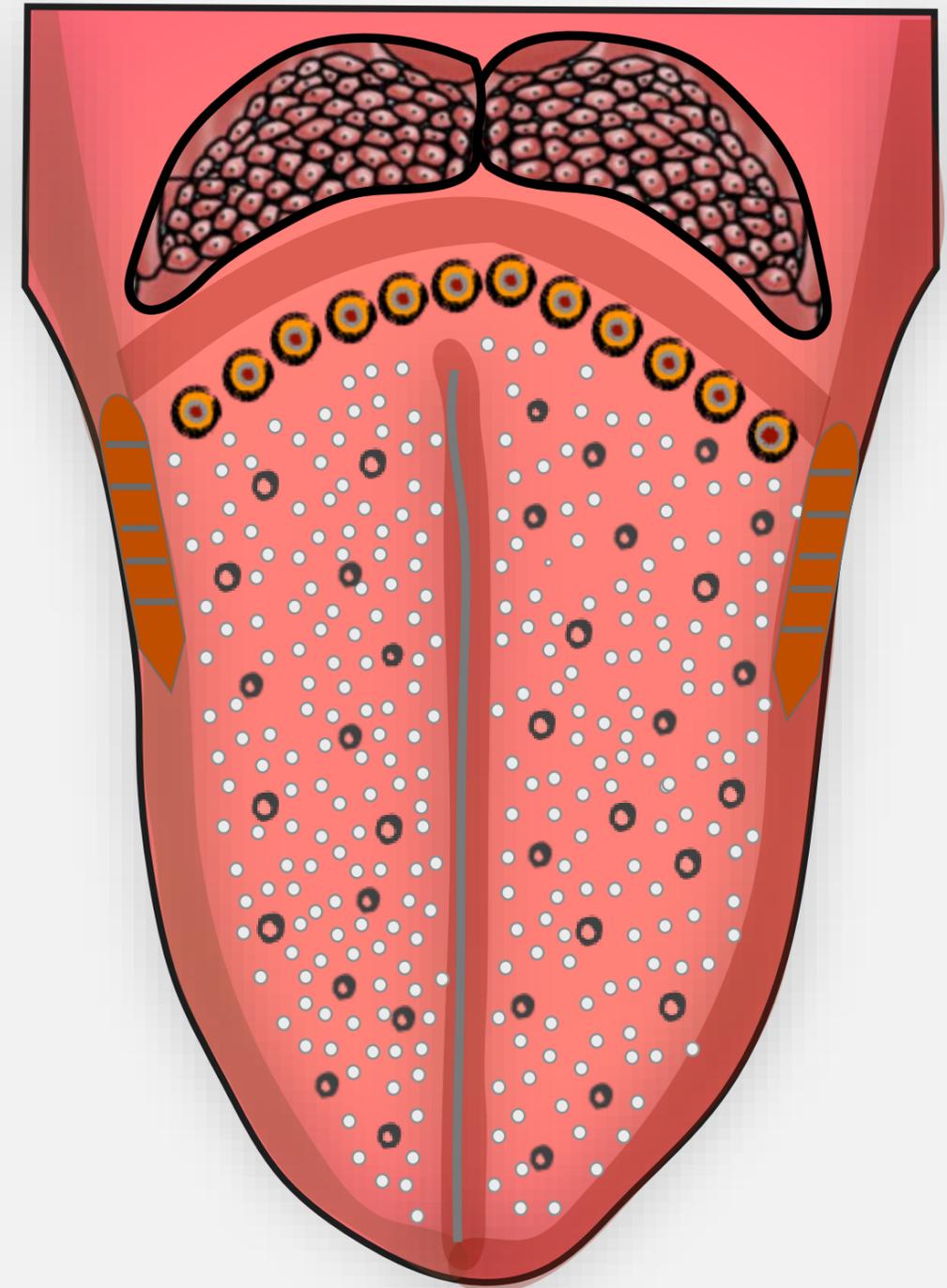
Lecture of

# Tongue and Gustation

Editor

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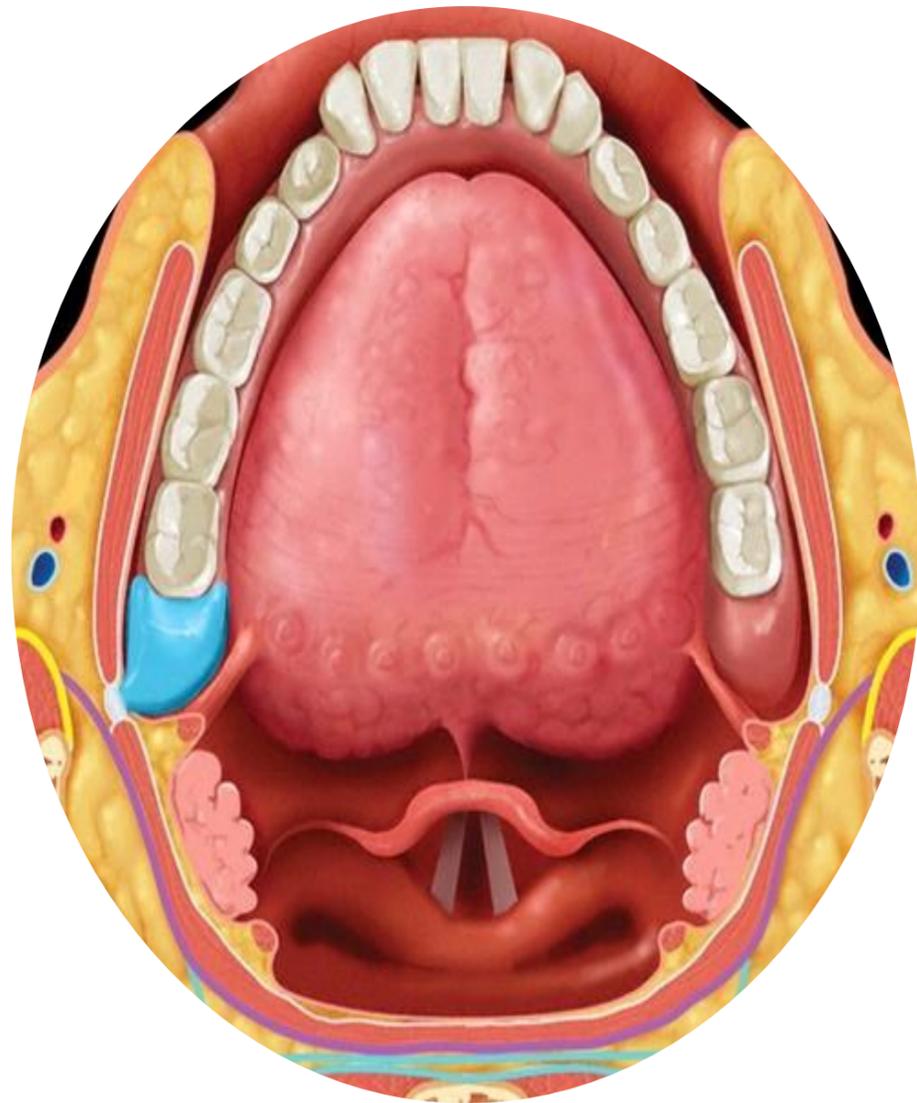
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# Tongue

## Definition:

The tongue is a muscular organ that lies in the oral cavity and occupies the floor of the mouth.



## Functions of the tongue:

1. Mastication and positioning of food.
2. Tasting the foods.
3. Swallowing.
4. Speaking.
5. Cleaning of the teeth.



# Anatomy of the tongue

- **The tongue** is divided into **anterior 2/3** and **posterior 1/3** which demarcated from each other by the **sulcus terminalis**.
- **Sulcus terminalis** is the line of demarcation between anterior 2/3 and posterior 1/3.

## 1. Anterior two-thirds of the tongue:

It is the movable part of the tongue characterized by the presence of tongue papillae and taste buds.

### Terminology:

- Movable portion of the tongue.
- Papillary portion of the tongue.

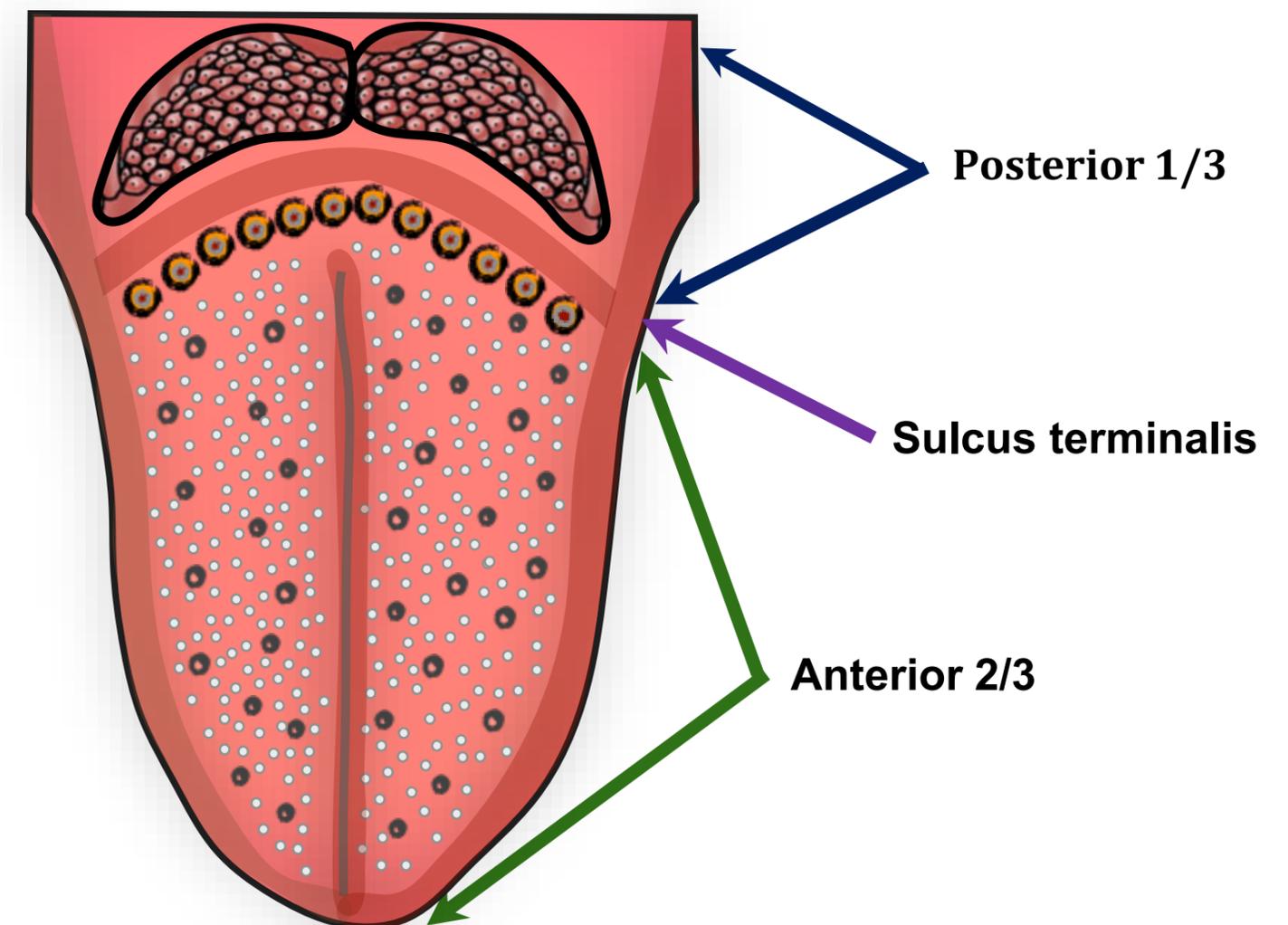
## 2. Posterior one-thirds of the tongue:

It is the fixed part of the tongue.

it characterized by the presence of lymphatic follicles.

### Terminology:

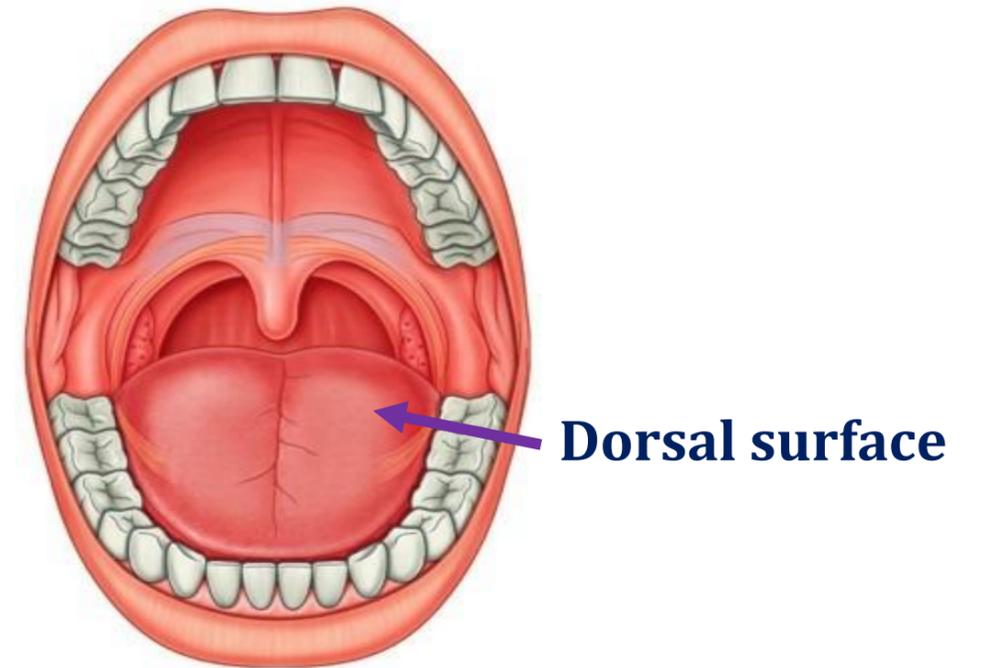
- Root of the tongue.
- Lymphatic portion of the tongue.



# Surfaces of the tongue

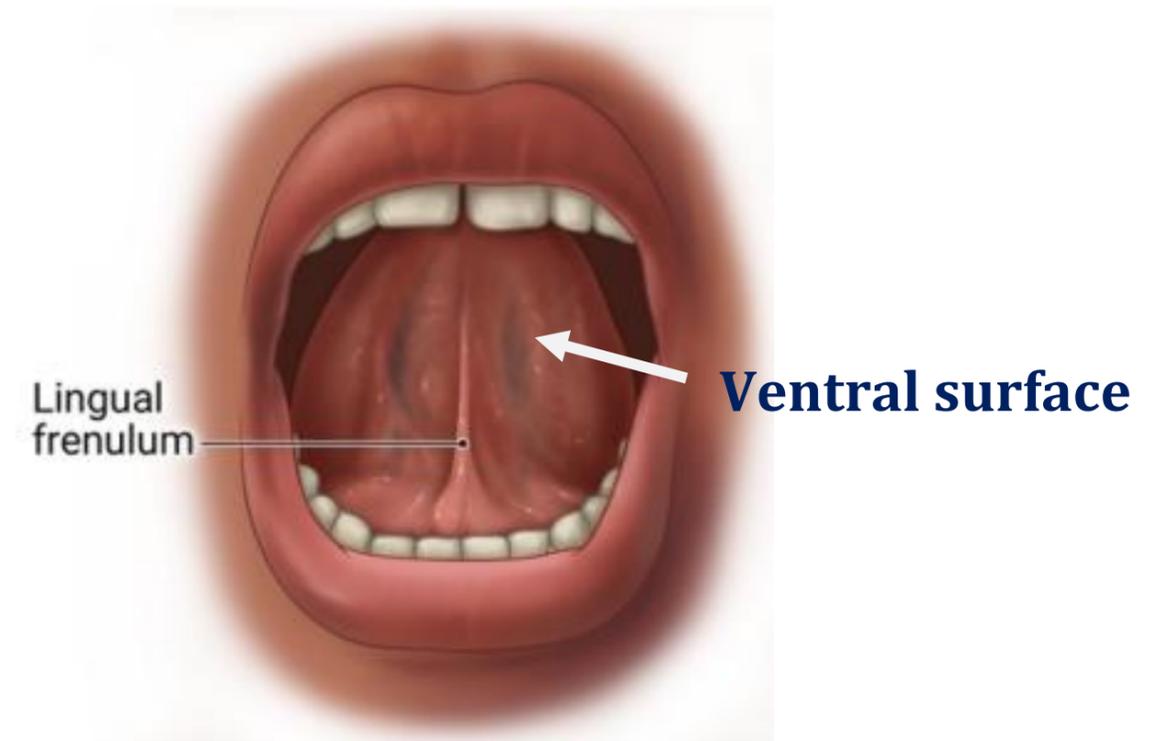
## Dorsal surface of the tongue:

- Facing the palate and composed of -----
- Anterior 2/3 covered by **tongue papillae**.
- Many tongue papillae contains **taste buds**.
- Posterior 1/3 contains **lingual tonsil**.



## Ventral surface of the tongue:

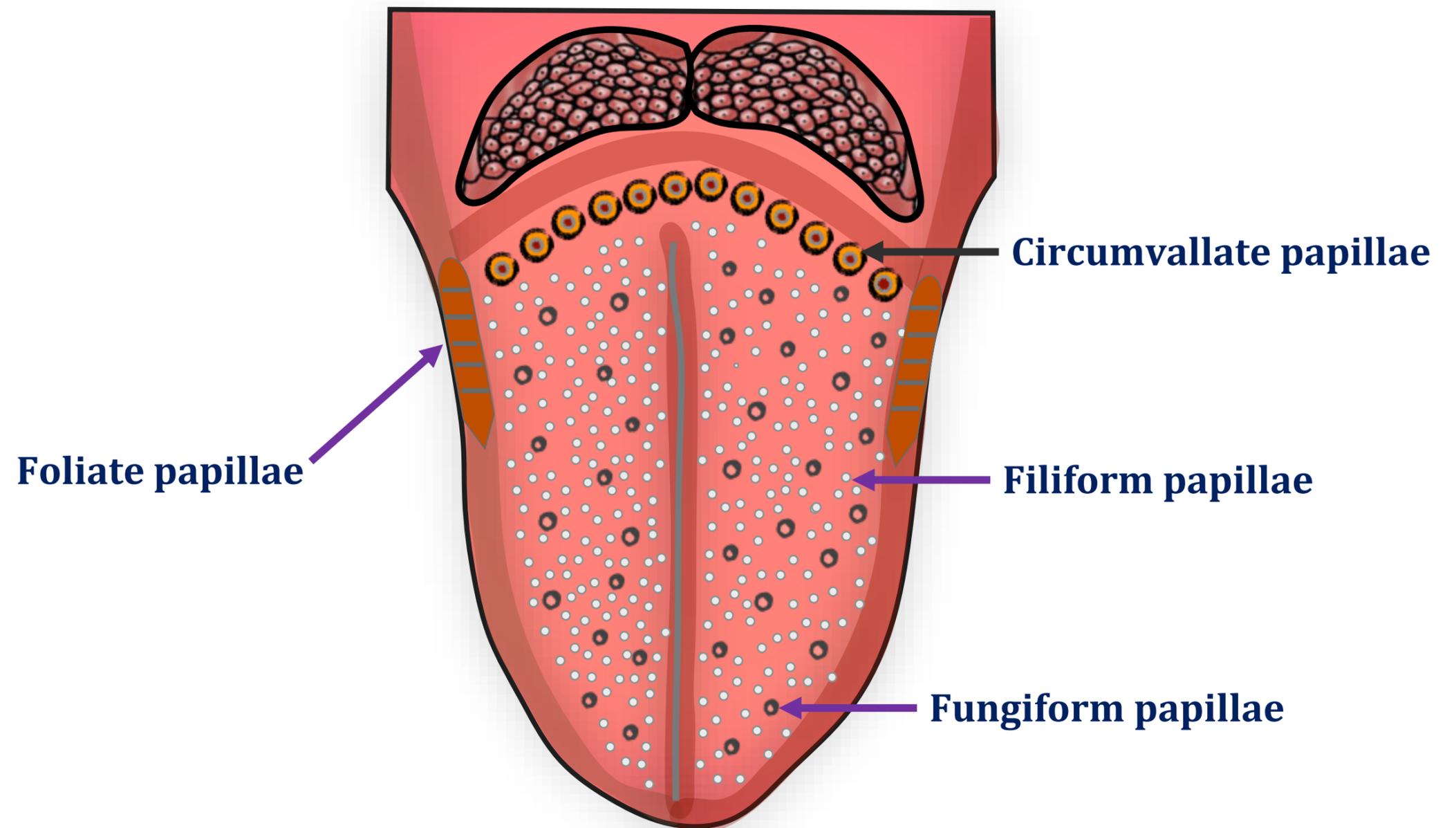
- Facing the floor of the mouth.
- Connect to the floor of the mouth BY the **lingual frenum**.
- Lingual frenum Provides stability to the tongue assists in controlling tongue movements protect from suffocation.



# Dorsal surfaces of the tongue

- The dorsal surface of the tongue is covered by stratified squamous epithelium and contains **tongue papillae**.
- **Tongue papillae** are tiny projections found on the dorsal surface of the tongue.
- **Tongue papilla are four types:**

1. Filiform papilla.
2. Fungiform papilla.
3. Circumvallate papilla.
4. Foliate papilla.



# Filiform papillae

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## Definition:

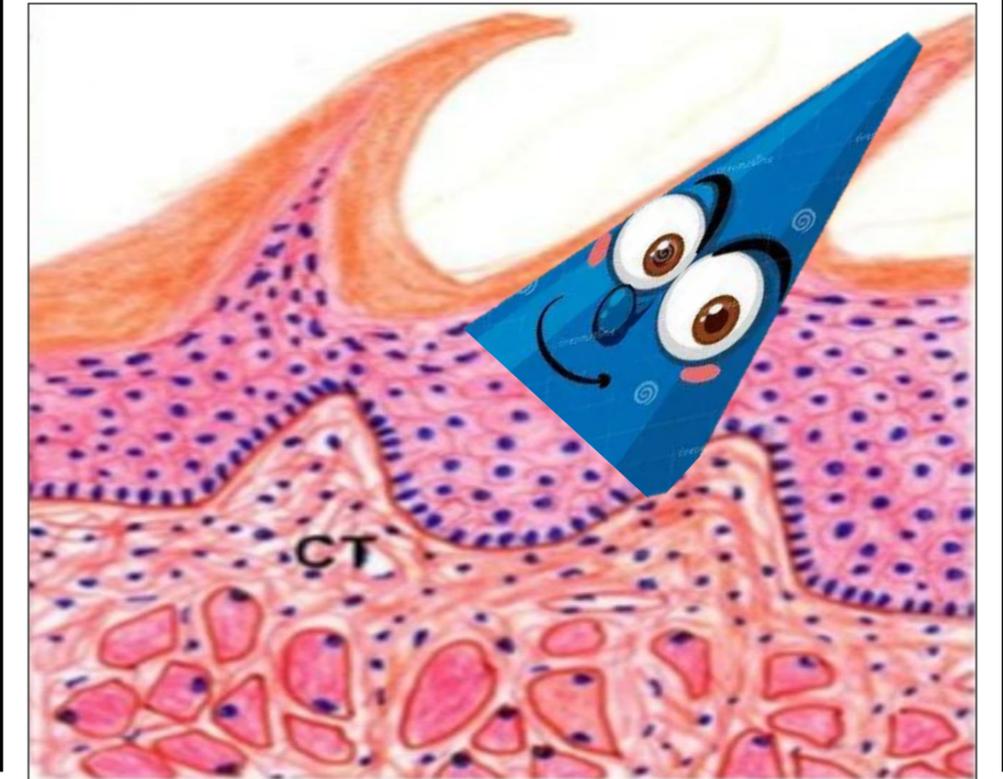
- They are cone-shaped elevations that cover the dorsal surface of the anterior 2/3 of the tongue.
- Filiform papillae are the most numerous type of papillae.

## Structure:

- Filiform papillae are slender cone-shaped structures.
- Filiform papillae are lined by keratinized stratified squamous epithelium and have a core of connective tissue.
- Filiform papillae are tilted toward the oropharynx.
- Filiform papillae do not have taste buds.

## Functions:

- provide a rough surface that helps in manipulating food during chewing and swallowing.
- Their keratinized tips protect the tongue from mechanical abrasion caused by food.
- They contain sensory nerve endings for touch that help in detecting food texture.
- Mouth cleaning.



# Fungiform papillae

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## Definition:

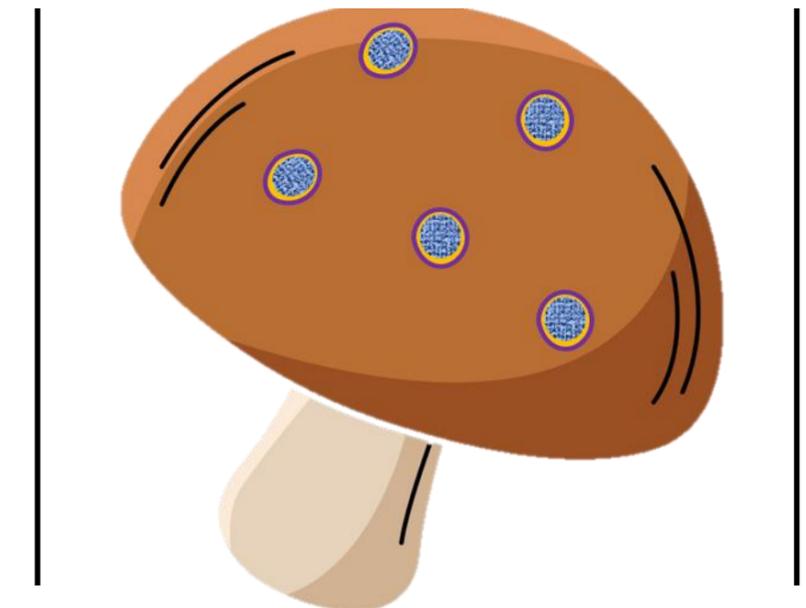
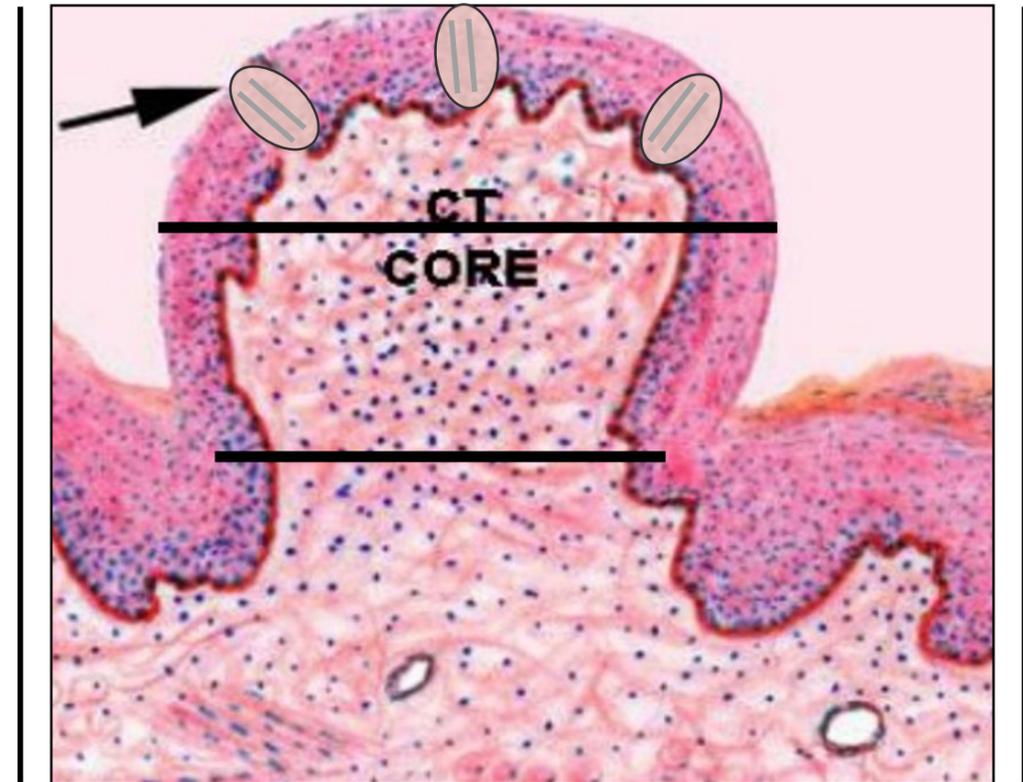
- Fungiform papillae are mushroom-shaped projections scattered among the filiform papillae on the dorsal surface of the tongue
- The number of fungiform papillae is considerably smaller than that of filiform.

## Structure:

- They are mushroom-shaped with a broad, rounded head and a narrow base.
- It is covered by non-keratinized stratified squamous epithelium.
- Under the epithelium, there is a core of connective tissue contains rich blood capillaries, giving them a reddish appearance.
- Each fungiform papilla contains about 3–5 taste buds on its upper surface, contributing to a total of 1,600 taste buds.

## Functions:

- Taste sensations of various materials, such as sweet, salty, sour, and umami.
- They help in sensing temperature of food and drinks (**thermoreceptor**).



# Circumvallate papillae

## Definition:

- Circumvallate papillae, are large, dome-shaped structures located in the front of sulcus terminalis on the dorsal surface of the tongue.
- Circumvallate papillae are about 8–12 in number.
- These papillae are larger than the rest.

## Terminology:

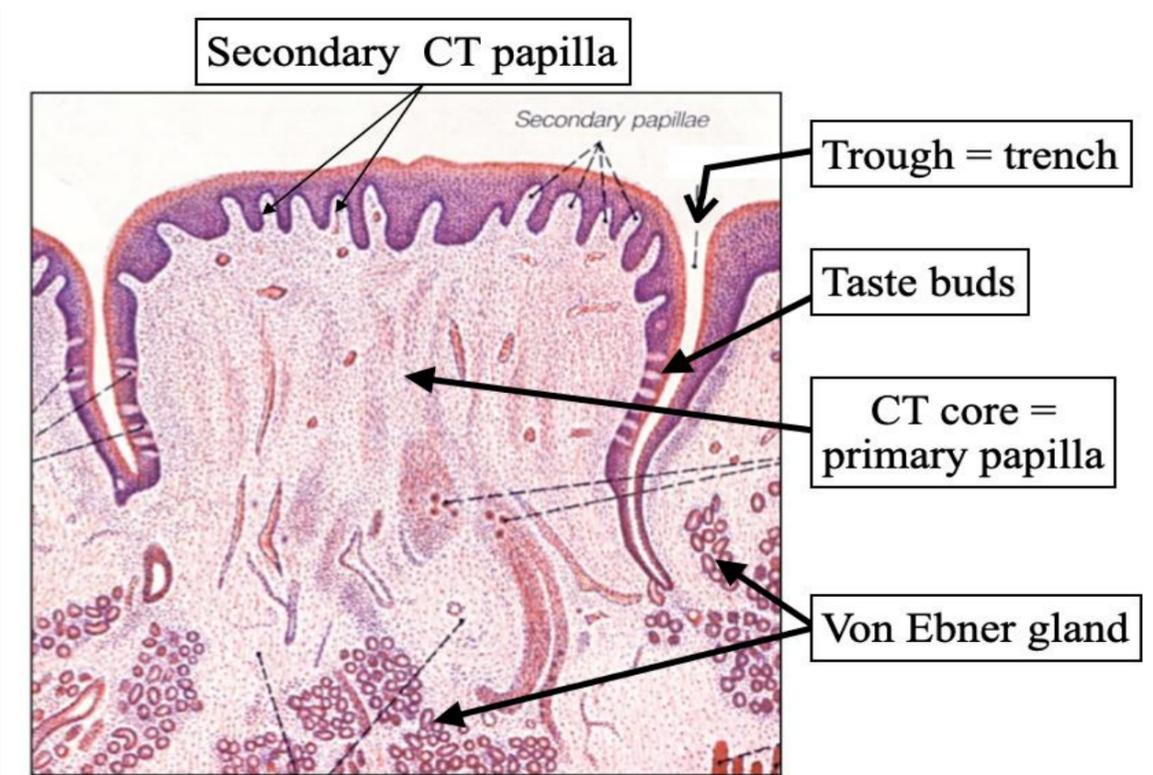
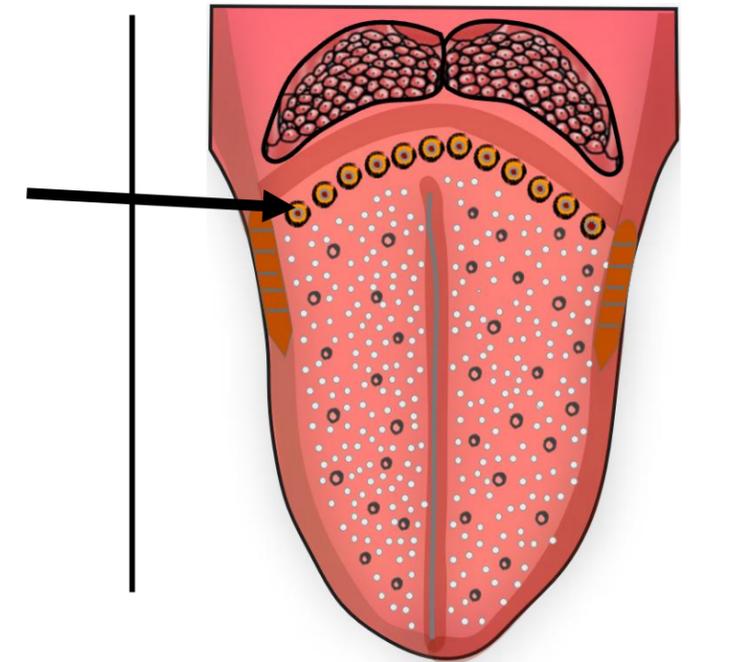
- Circumvallate papillae also, termed **Vallate papillae**.

## Structure:

- Large papillae embedded within the tongue, with their upper surface flush with the tongue's level and encircled by a deep circular trench.
- It is covered by non-keratinized stratified squamous epithelium and CT Core.
- Each one papilla contains around 250 taste buds on its lateral walls.
- **Von Ebner gland** open within the trench of the papilla to clean up it and assist in taste stimulation.

## Function:

- Mainly involved in taste sensation, especially for bitter tastes.



# Foliate papillae

## Definition:

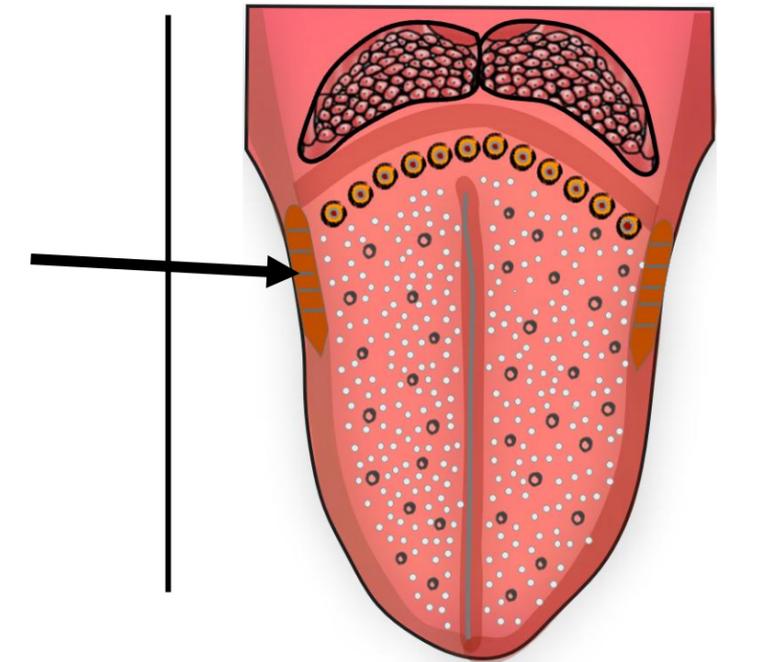
- Foliate papillae are series-shaped mucosal projections located on the lateral margins of posterior part of the anterior 2/3 of the tongue.
- Number of foliate papillae reach up to 20 papilla.
- Foliate papillae are found particularly in the early life and become less prominent in adult.

## Structure:

- It is covered by non-keratinized stratified squamous epithelium and CT Core.
- Each one papilla contains around 150 taste buds on its lateral walls.
- Von Ebner gland open within the trench of the papilla to clean up it and assist in taste stimulation.

## Function:

- Mainly involved in taste sensation.



# Nerve supply of the tongue

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## **I. Motor:**

1. Hypoglossal nerve (CN XII).
2. Vagus nerve (CN X), supplies the palatoglossus muscle.

## **I. Sensory:**

### **1. Anterior 2/3 of the tongue:**

- **General sensation:** Lingual branch from (CN V3).
- **Taste sensation:** Chorda tympani branch of facial nerve (CN VII).

### **2. Posterior 1/3 of the tongue:**

- **General and taste sensation:** Glossopharyngeal nerve (CN IX).

# Gustation and Taste Buds

## Definition of gustation:

- **Gustation** is the special sense responsible for the perception of taste.
- **Gustation** is detected by special organ termed taste buds = Gustatory organ.

## Definition of taste buds:

- **Taste buds** are specialized sensory structure found mainly on the dorsum of the tongue.

## Number of taste buds

5,000 to 10,000.



## Distribution of taste buds:

1. Tongue:
  - Upper surface of fungiform papillae.
  - Lateral walls of Vallate and Foliate papillae.
2. Soft palate.
3. Pharynx.
4. Larynx.
5. Upper part of esophagus.
6. Epiglottis in infants.

## Nerve supply of taste buds

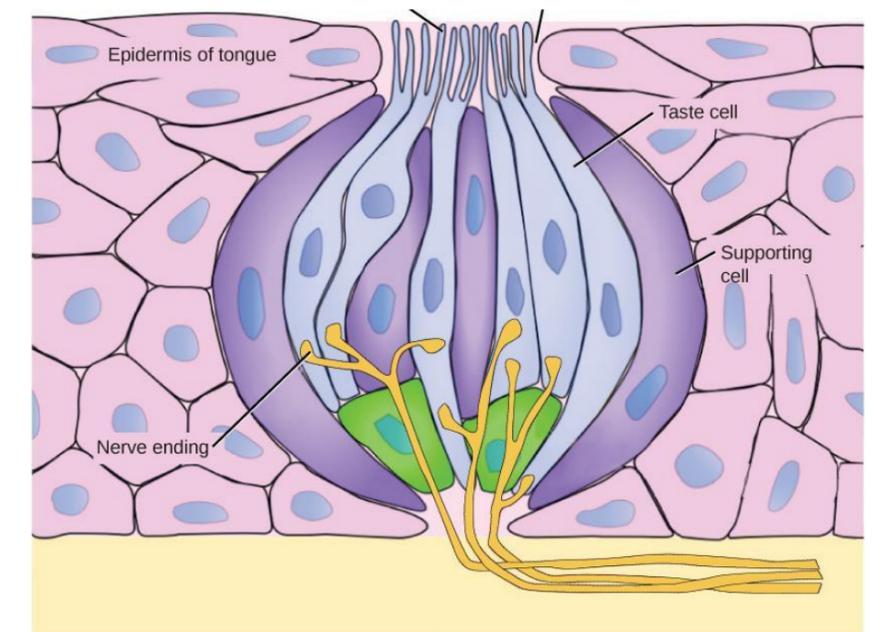
1. Chorda tympani branch of facial nerve (CN VII).
2. Glossopharyngeal nerve (CN IX).
3. Vagus nerve (CN X): epiglottis and pharynx.

# Taste buds

- Taste buds are barrel shaped sensory organs of about **50–100  $\mu\text{m}$  long**.
- It represent a specialized **chemoreceptor cells** that detect taste stimuli.

## Site:

- Taste buds are found in both fungiform, vallate and foliate papillae.
- Filiform papillae not contain taste buds and function only for touch.
- Also, taste buds are found in soft palate, uvula, and epiglottis.



# Structure of taste buds

- Specialized chemoreceptor cells take the whole thickness of oral epithelium.
- It is composed of body and pore opened in the oral cavity.
- It contacts at the CT with nerve endings to transmit the sensation to the brain.

## The barrel shape is composed of three types of cells:

### 1. Supporting cells:

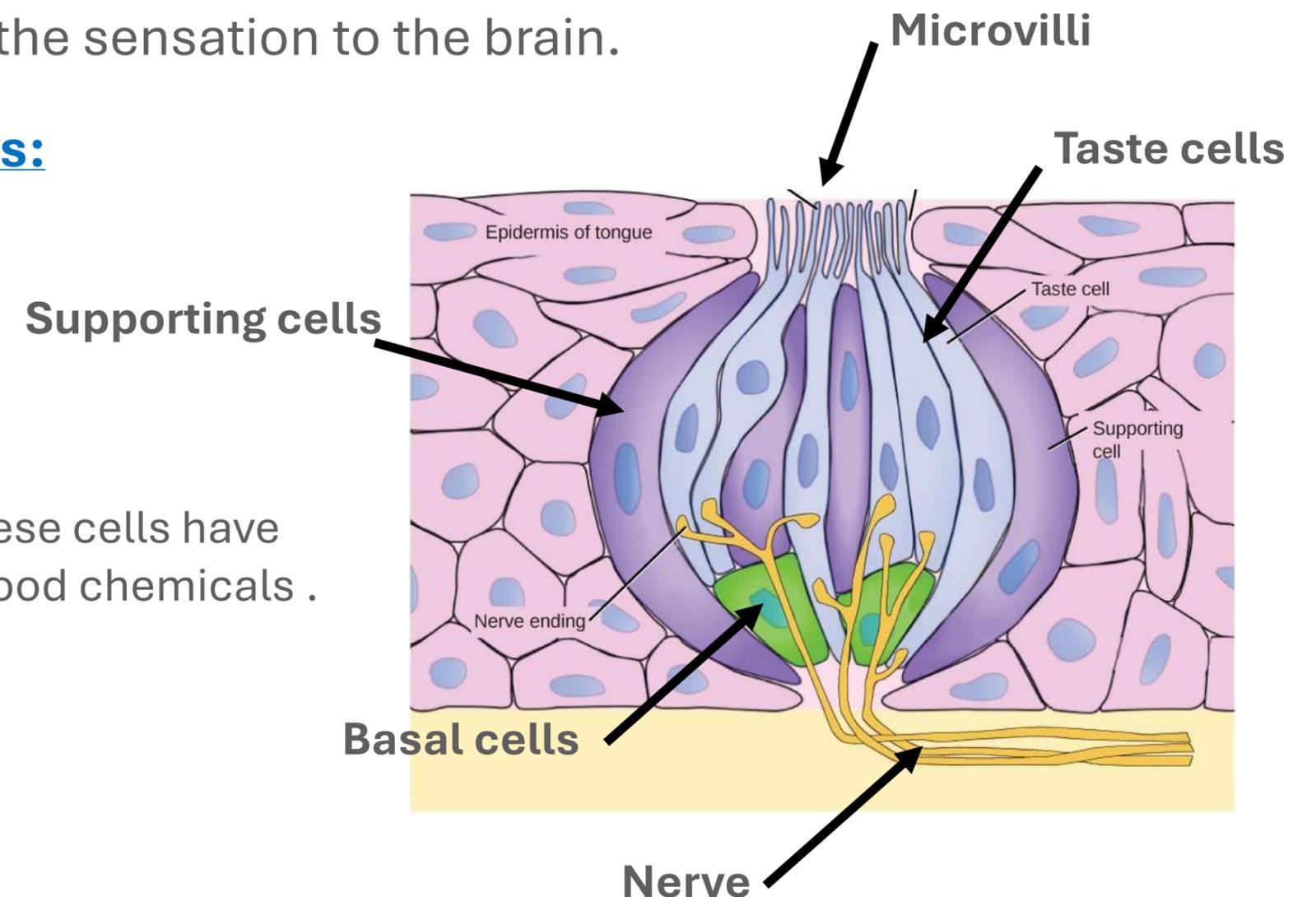
Provide structural and metabolic support for the taste buds.

### 2. Taste cells:

Specialized **chemoreceptor cells** that detect taste stimuli. These cells have **microvilli** that project into the **taste pore** for detection of the food chemicals .

### 3. Basal cells:

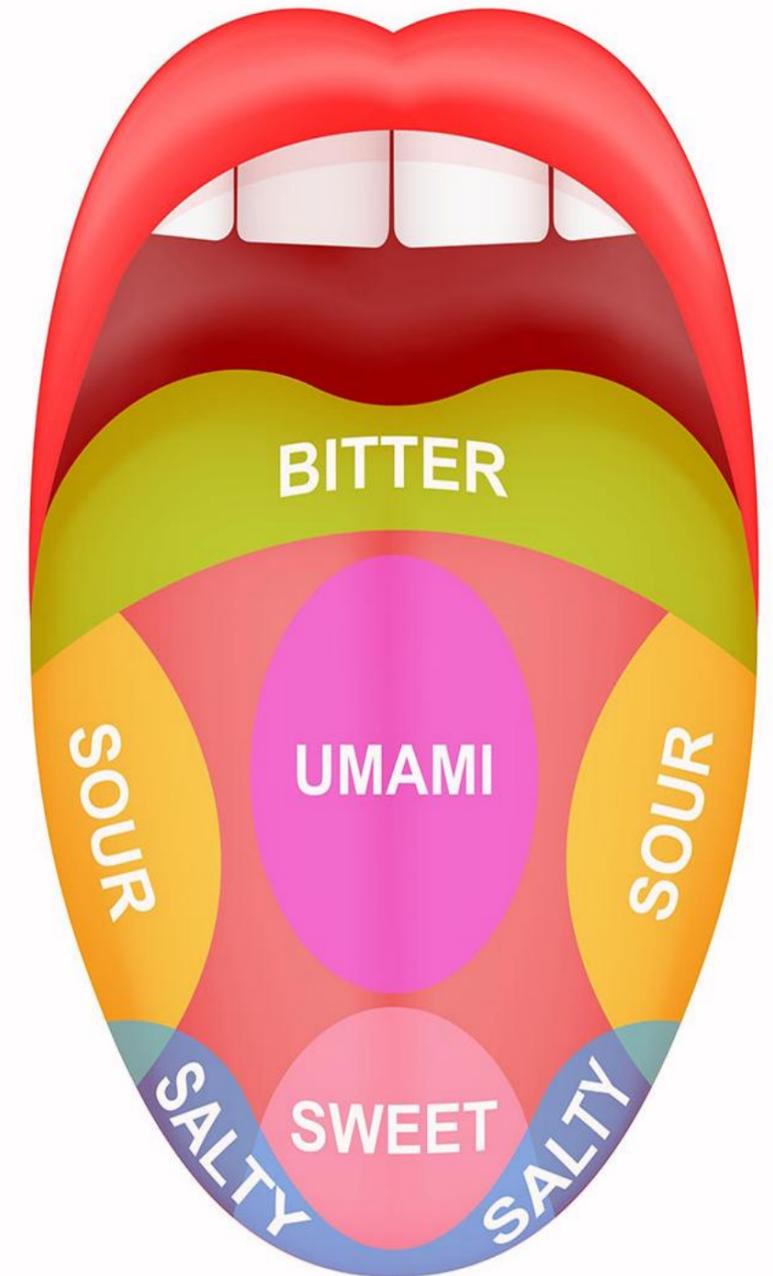
Act as stem cells, replacing old gustatory and supporting cells.



# Types and distribution of taste sensation

## There are five universally recognized taste qualities:

- 1. Sweet:** Usually signals carbohydrates (energy sources).
- 2. Salty:** Indicates essential electrolytes ( $\text{Na}^+$ ,  $\text{K}^+$ ).
- 3. Umami** Detects amino acids (protein-rich foods).
- 4. Bitter:** Associated with toxins and plant alkaloids; protective.
- 5. Sour:** For detection of acids ( $\text{H}^+$  concentration) to avoid excess acid intake.
- 6. Recently:** Fats, metallic, and water may be an additional taste modalities.)



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welcome