



**Physiology Team**



# Lecture : 12

## Physiology of taste and smell

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**Reviewed By: Shaimaa Alrefaie**

# OBJECTIVES

At the end of this lecture, student should be able to describe:

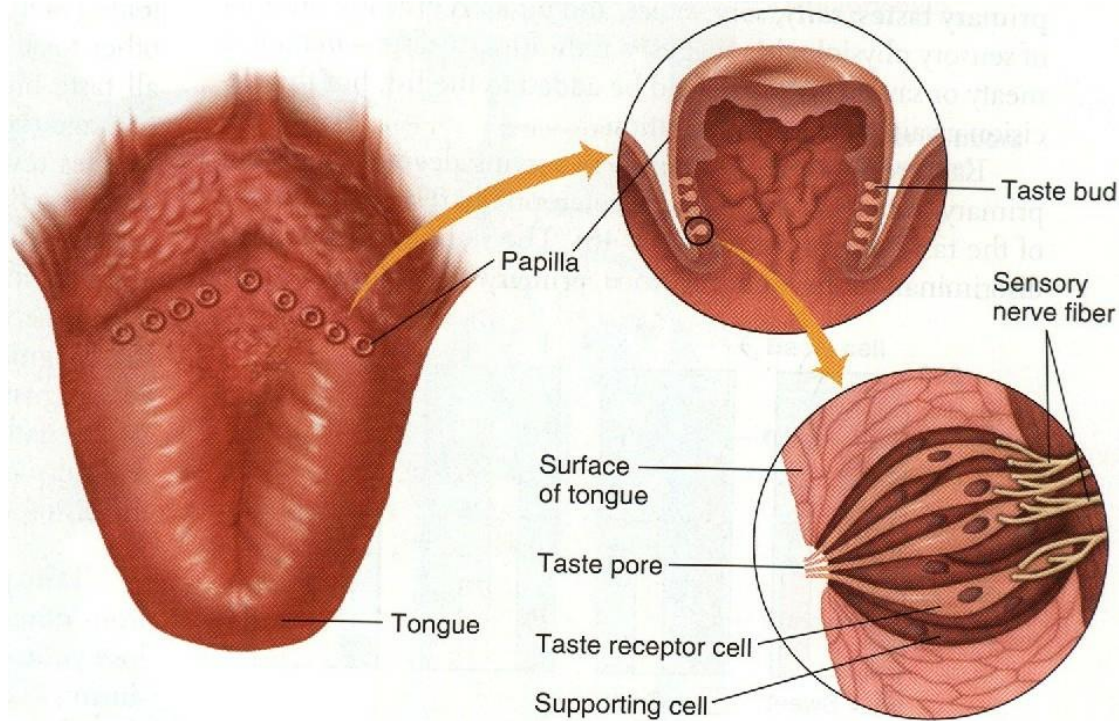
**Not given**

# MIND MAP



# Taste

➤ **Taste bud** is specialised **receptors** in the oral cavity but mainly on the (projections found in the ) tongue, some on the palate and **epiglottis**.



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**Taste Receptors**



➤ **Lingual papillae** are small nipple or hair like structures on the **dorsum** of the tongue.

## ➤ **Types of papillae (projection):**

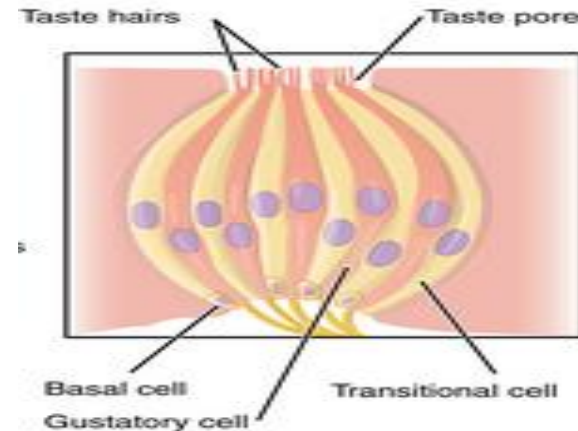
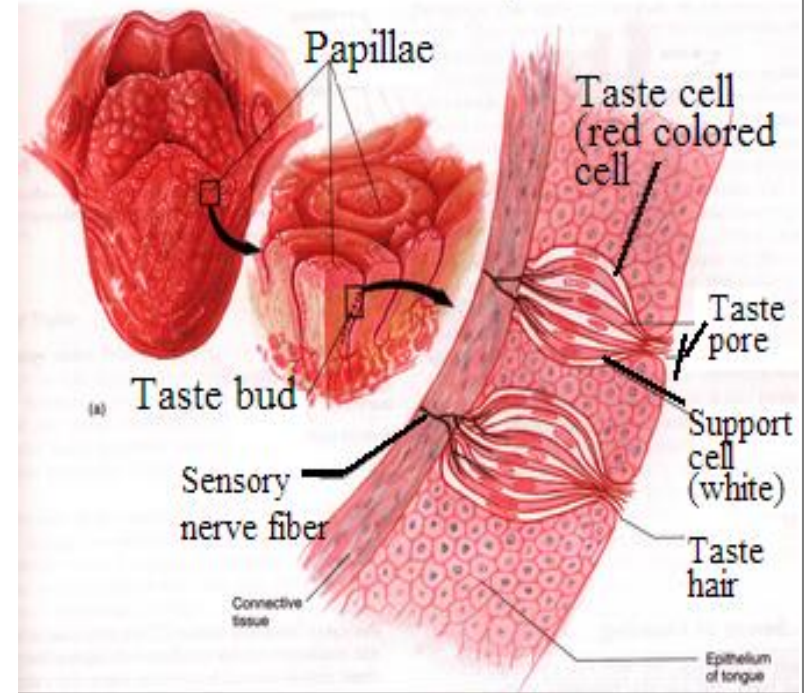
- 1) Filiform ➡ these are thin, long papillae "V"-shaped
- 2) Fungiform ➡ these are slightly mushroom -shaped
- 3) Circumvallate ➡ they are arranged in a circular-shaped row

➤ **There is No taste buds on the mid dorsum** of the tongue.



➤ **Taste bud** : gustatory cells with microvilli (gustatory hair)  
 They are **receptors cells** with **cilia** projected through taste pore in between there are **supporting cells**.  
 There is stereocilia from one side and the nerve fibers from the other side which form the auditory nerve.

\* **Basal cells** develop into supporting cells then receptor cells.



➤ When stimulated produce nerve impulse to specific brain area through:

Anterior 2/3 of the tongue »»»»» VII (facial nerve)

Posterior 1/3 of the tongue »»»»» IX (glossopharyngeal nerve)

Receptors on the palate, pharynx, epiglottis (the rest of oral cavity) »»»»» X (vagus nerve)

➤ Teste sensation pathway:

➤ **First order neurone:**

Taste fibres from the three cranial nerves (VII, IX, X)

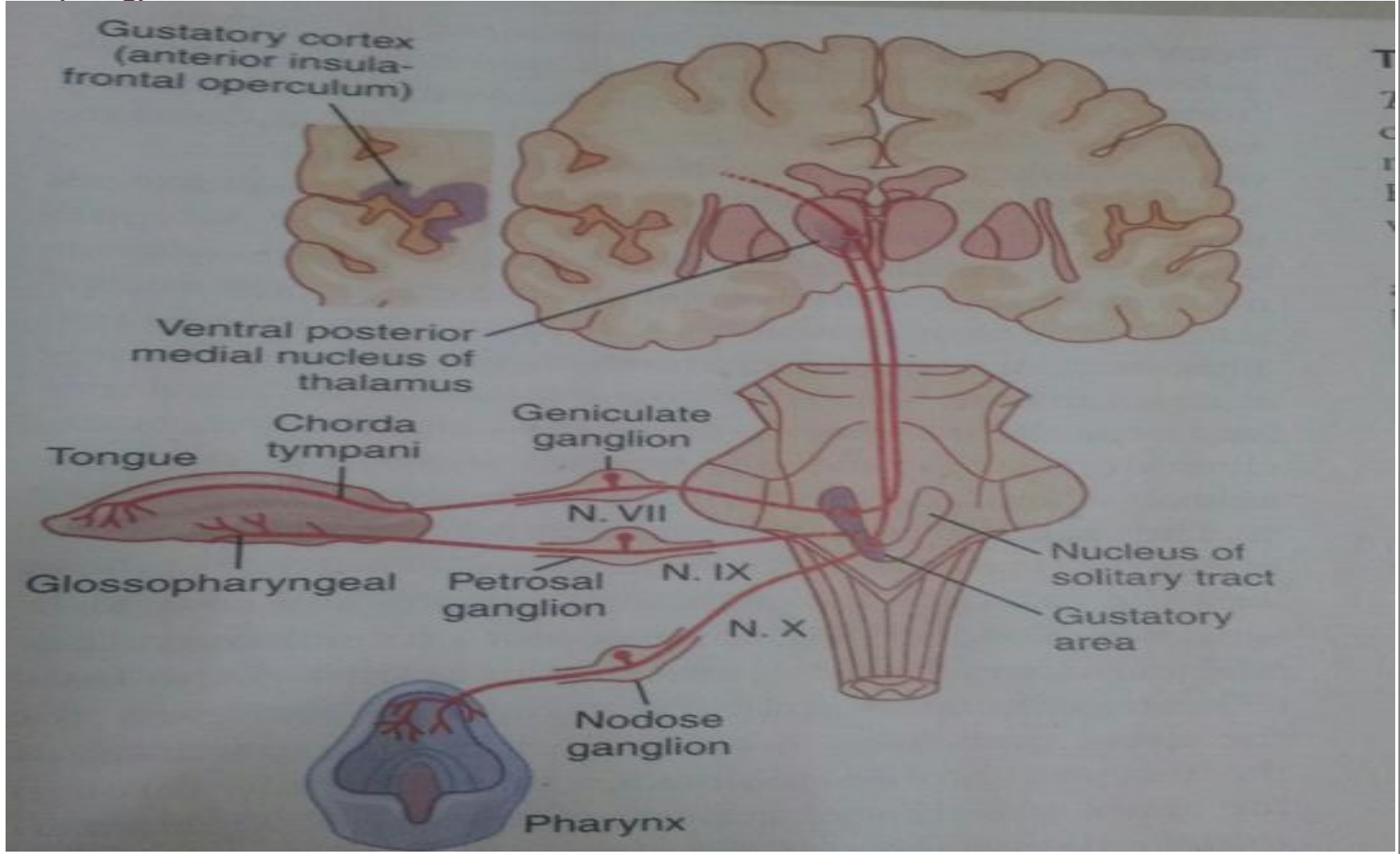
form **tractus solitarius** »»»»» end in the nucleus of tractus solitarius (cross in the medulla oblongata)

➤ **Second order neurone:**

From TS (tractus solitarius) cross the midline to ascend in the **medial lemniscus** to the thalamus

➤ **Third order neuron:**

from **thalamus** project the **cerebral cortex** through thalamic radiation.



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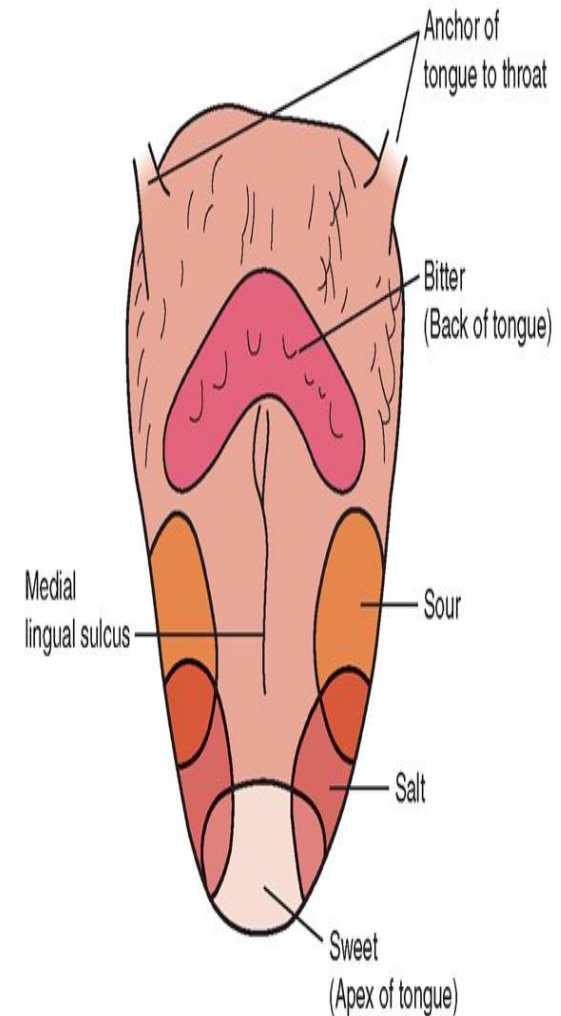
## ➤ Mechanism of stimulation of taste buds:

Molecules dissolve in the saliva »»»»» attached to **receptors** on cilia of gustatory cells »»»»» receptors **potential** »»»»» **action potential**.

\*combination between molecules and receptors are weak (since taste can be easily abolished by washing mouth with water)

## ➤ Distribution of taste buds on tongue not uniform:

- **sweet** - tongue **tip**
  - **sour** - tongue **margins**
  - **bitter** - **back** of tongue
  - **salt** - **widely** distributed
- 
- **Sweet** receptors respond to »»»»» sugar, saccharine, some amino acids.
  - **Sour** receptors respond to »»»»» H ion.
  - **Salty** receptors respond to »»»»» salts.



## ➤ Pathophysiology

Disease	Example
<b>Ageusia</b> (complete <u>loss</u> of taste)	Tumor, trauma, <b>Gentic</b>
<b>Dysgeusia</b> (disturbed taste)	Hormonal effect (Pregnant)
<b>Hypogeusia</b>	Common cold = <b>flu</b>
<b>Hypergeusia</b>	Adrenal insufficiency,

Geusia means taste

# Smell

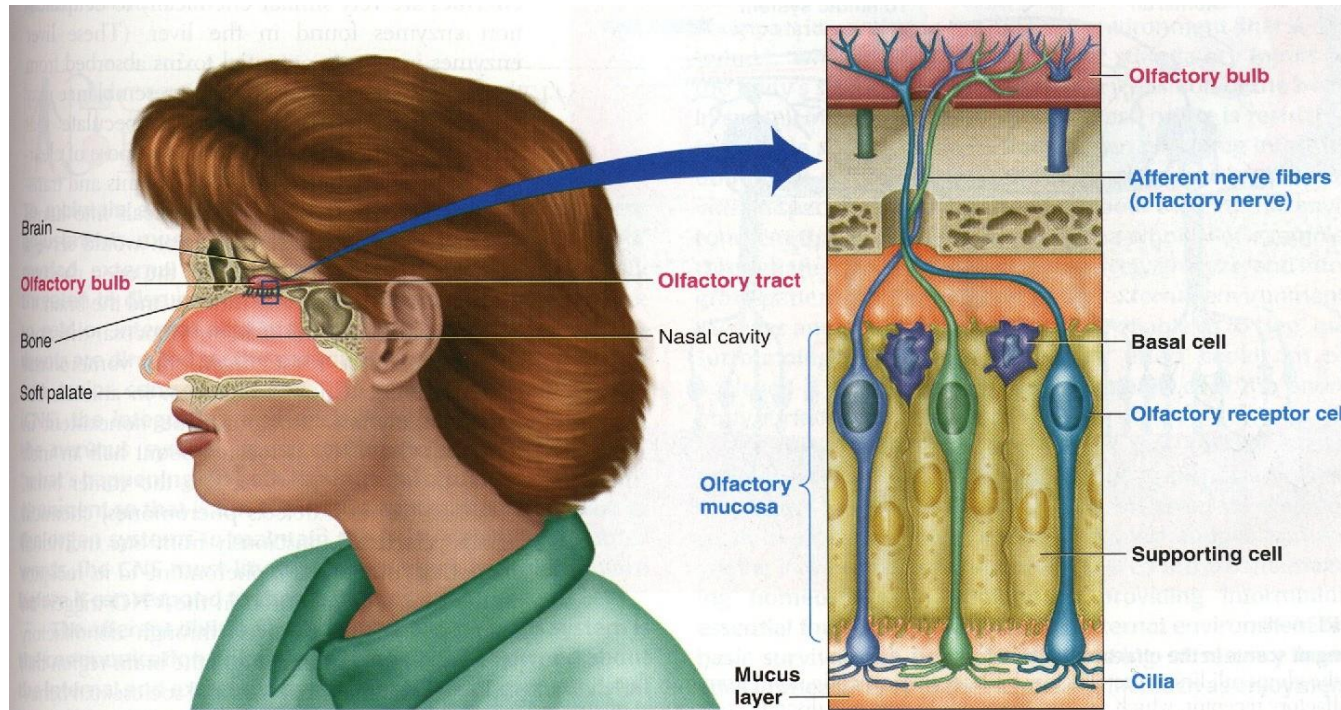


FIGURE 6-47  
Location and structure of the olfactory receptors

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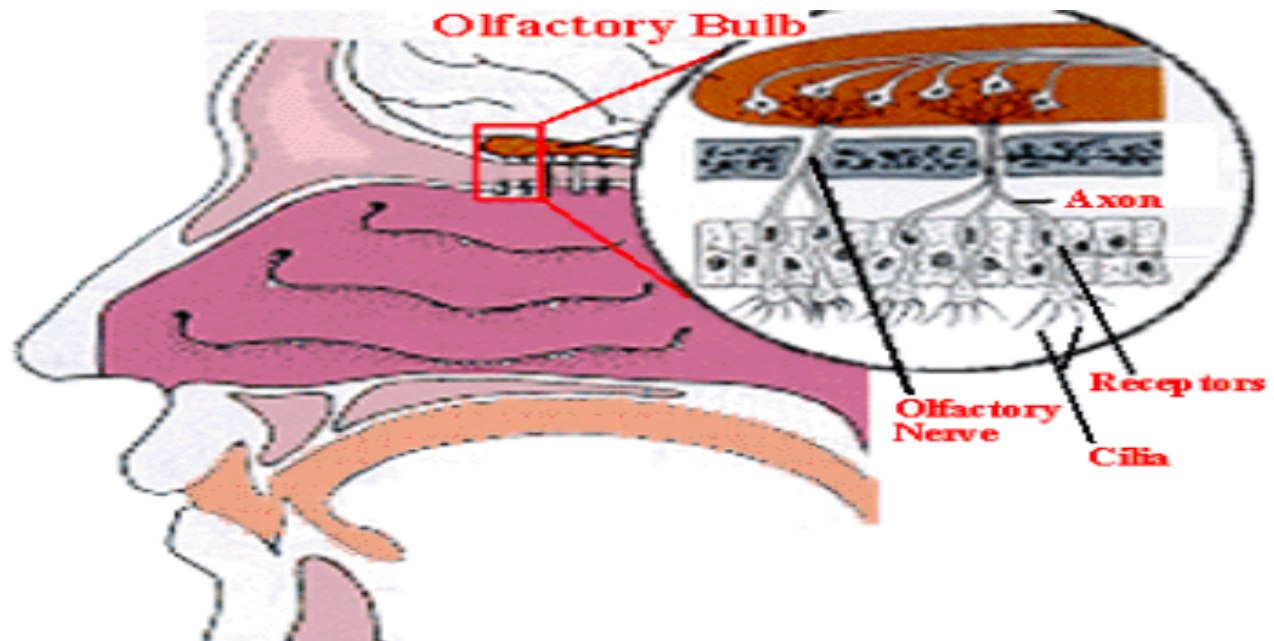
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**Olfactory mucus:** in the **roof** of nasal cavity (**small area**) near the septum.

\*Contain olfactory receptors (**bipolar** neurone).

\*Axons collected in bundles called **fila olfactoria** .



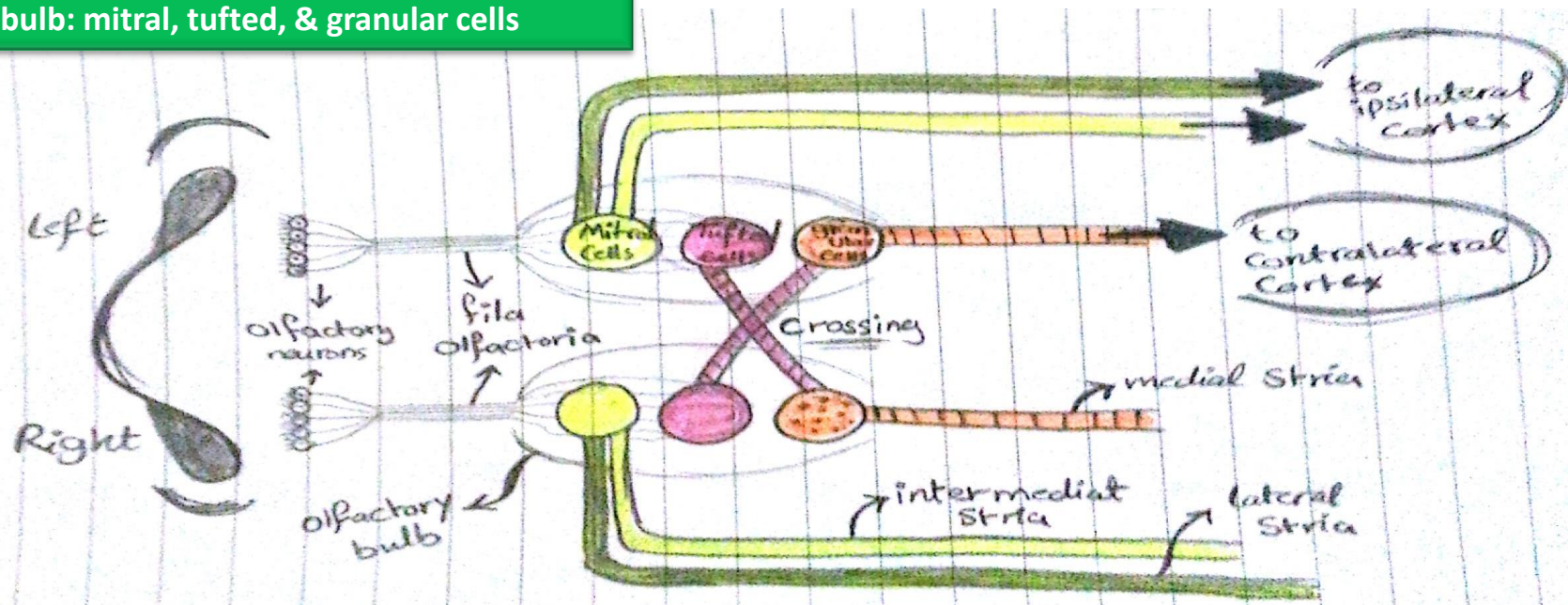


**Fila olfactoria** (bundle of nerve fiber) enter olfactory bulb (inside the brain) through the cribriform plate »»»» synapse with **mitral and tufted cells**

»» from **mitral cells** lateral and intermediate stria start »»»» end on **ipsilateral cerebral cortex**  
 »»»» from **tufted cells** medial stria start then cross the midline & end on **granular cells** in opposite side (**contralateral**)

We have 3 types of cells in the olfactory bulb: mitral, tufted, & granular cells

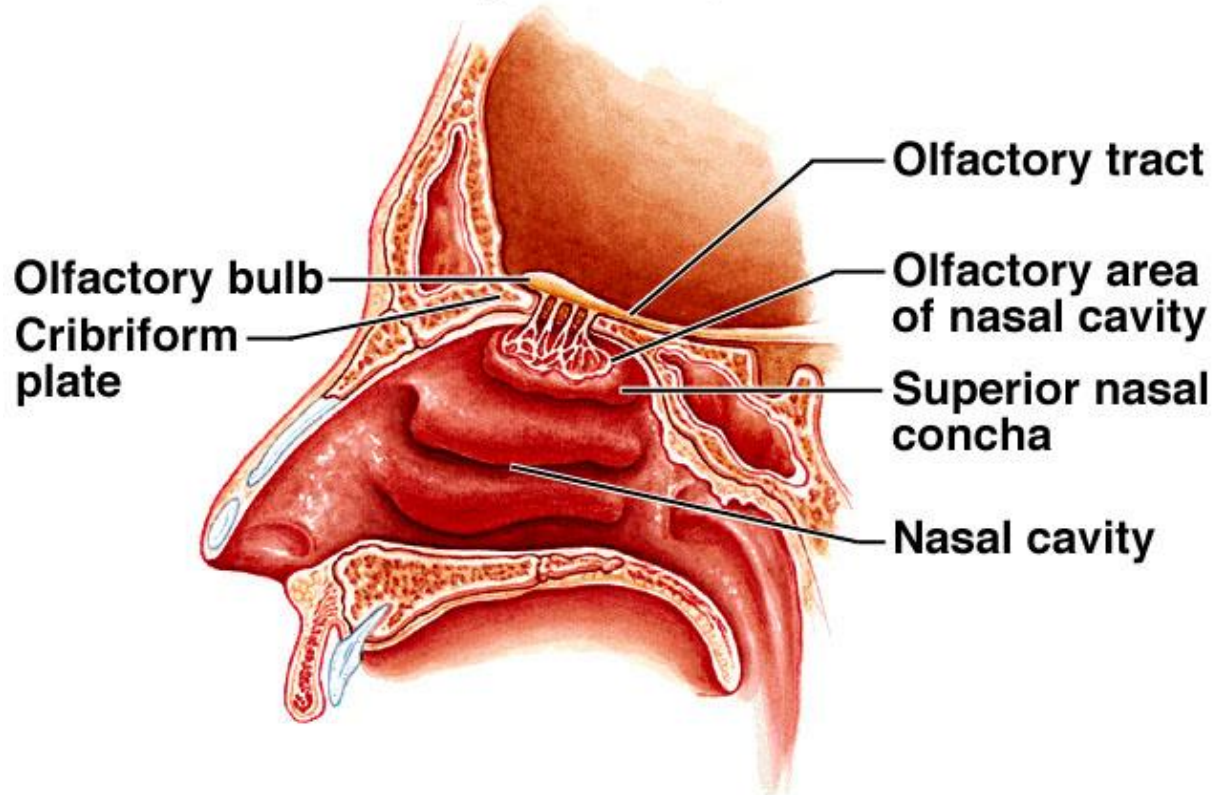
Where in cerebral cortex: in the frontal lobe & base of the parietal lobe



❖ From Latifah AL-fahad.

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# Olfactory Receptor Cells



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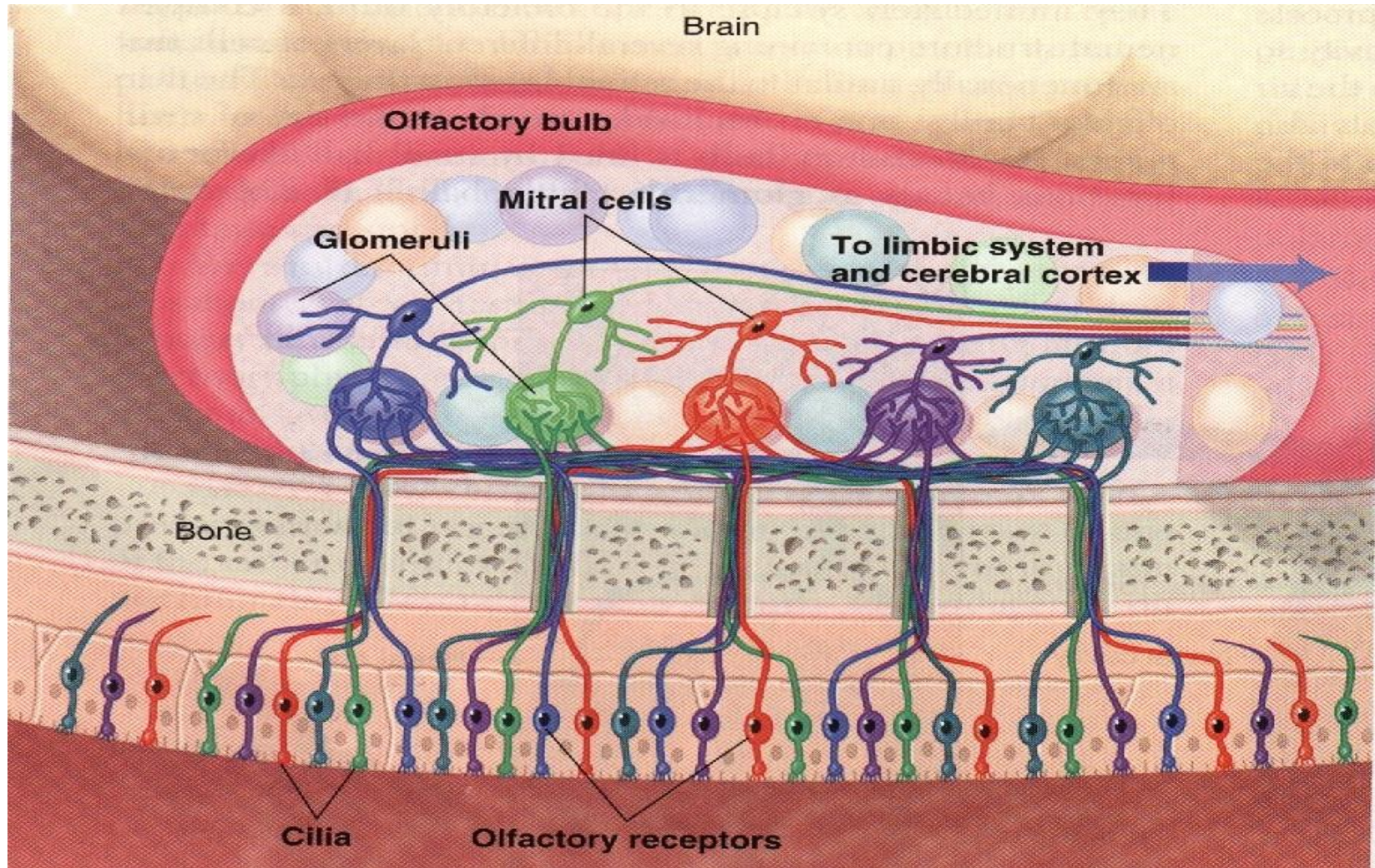
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## ➤ limbic system:

appears is a complex set of brain structures that lies on both sides of the thalamus, It supports a variety of functions, including emotional, behaviour , feelings and has a great deal to do with the formation of memories.

\*impulses travel along the olfactory tracts to the **limbic system**.

\*impulses are interpreted in olfactory cortex **Deep in temporal lobe and base of frontal lobe thalamus**

# Mechanism of stimulation of olfactory receptors

(physiology of olfaction)

Molecules dissolve in mucus layer »»»» combine with receptors on cilia »»»»  
stimulate **adenylat cyclase** »»»» increase intracellular **cAMP** »»»»  
opening of Na channels »»»» receptors potential »»»» **AP** in olfactory pathway.

\*Human can differentiate between **2000-4000** odours.

\***Adaptation** can occur to pleasant and nasty (smells due to changes both in **receptors** and **central** connection.



Disease	Example
<p><b>Anosmia</b> loss of smell sensation</p>	<p>Cancer patient ,tumor, trauma (due to damage to olfactory epithelium)</p>
<p><b>Parosmia (dysosmia)</b> Alteration in smell sensation</p>	<p>Hormonal effect(Pregnant)</p>
<p><b>Hyperosmia</b> (increase in smell sensation)</p>	<p>Adrenal insufficiency</p>
<p><b>Hyposomia</b> (decreased smell sensation)</p>	<p>Vitamin A deficiency  Common cold =flu</p>

# QUESTIONS

True or False

- \*people are able to distinguish four main types of tastes: sour, sweet, salty, and bitter.
- \*you are able to recognize a taste through your sense of smell.
- \*Hormones can affect your taste and smell.
- \*Most doctors diagnose smell disorders by using a scratch and sniff test.
- \*Losing your sense of smell or taste can be an early warning sign of more serious illness
- \*Losing your sense of smell or taste can be annoying, but it doesn't pose any risks.
- \*All taste and smell disorders are caused by injury or illness.
- \*Taste disorders are more common than smell disorders.

True ,true ,true ,true ,true , False , False , False

**THE END**

**If there are any Problems or Suggestions,  
Feel free to contact:**

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**THANK YOU**