TASTE

- The sense organs for taste are **taste buds.**
- There are 10000 taste buds in man.

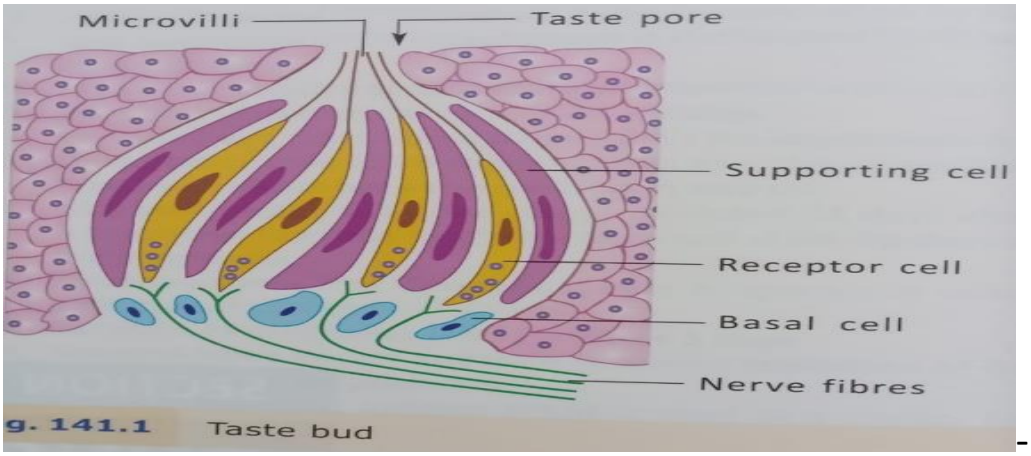
Most of the taste buds are distributed in the dorsum of the tongue, but a few are seen in mucous memb covering soft palate, epiglottis, larynx and pharynx.

Taste bud It is made up of 3 types of cells –

-receptor cells

Supporting cells

Basal cells



The taste bud opens into the oral cavity by a taste pore.

- The receptor cells are bipolar cells . they have microvilli at one end and gustatory afferent nerves at the other end. Microvilli projects into the taste pore.
- Supporting cells give support . they surround and support the gustatory cells. The tips of receptor cells and supporting cells are connected to each other by tight junctions.
- Basal cells differentiate into receptor cells

Innervation of taste buds

Receptor cell make synaptic contact with afferent nerve fibres.

Each taste bud is innervated by 50 nerve fibres and each nerve fibre receives input from 5 taste buds.

Taste modalities

- There are 5 taste sensations
- **Sour , salt , sweet, bitter and umami**
- **Sweet**- it is best appreciated at the tip of tongue

it is produced by organic substances-polysaccharides, alcohol etc

- Salt--best appreciated at lateral margin of tongue

  -- it is produced by salts

- Sour- best appreciated on lateral margin of the tongue

  -- it is produced by acids which release H+ ions

- Bitter - best appreciated at the back of tongue.

  - produced by alkaloids like quinine

- Umami – it is a pleasant and sweet taste sensation different from standard sweet taste

  it is produced by monosodium glutamate

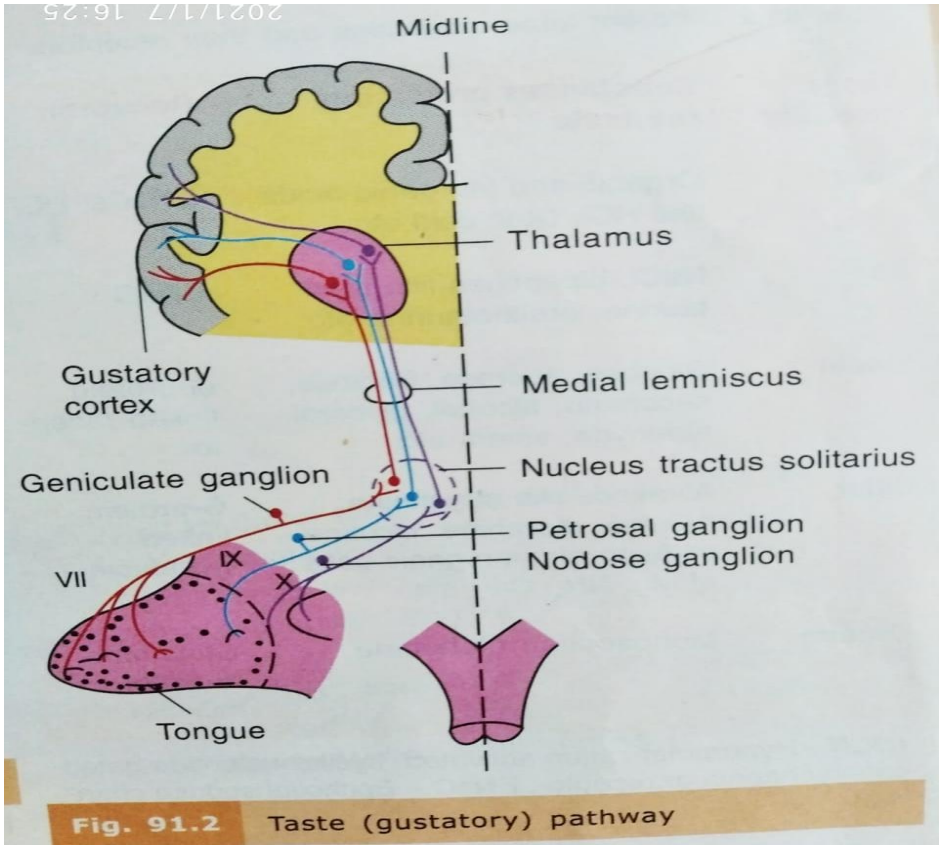


Fig. 91.2 Taste (gustatory) pathway

Taste pathway

- --three order uncrossed pathway
- **1st order neurons are**

  --Chorda tympani branch of 7th cranial nerve---carries sensations from anterior 2/3 rd of tongue

  --Glossopharyngeal nerve (9th nerve) carries sensation from posterior 1/3rd of tongue.

  ---Vagus nerve (10th cranial nerve)—carries information from the receptors present on epiglottis, pharynx etc.

Taste fibres from these 3 nerves reach the **NTS** (Nucleus of Tractus Solitarius) in medulla oblongata

From NTS 2nd order neurons arise and reach in VPMN(ventral Posteromedial nucleus of thalamus

From VPMN -3rd order neurons arise and end in gustatory cortex.

- **Mechanism of taste perception**

Receptors for taste are present in the microvilli of the gustatory cell.

- **The taste producing substance dissolves in saliva and comes in contact with the villi through taste pores present in taste buds.**
- **This contact brings about changes in the receptor cells of the taste buds resulting in generation of generator potential.**
- **Neurons carry this potential to taste area of cerebral cortex.**
- **Mechanism of stimulation of taste receptors**
- To stimulate taste receptors , the substance should dissolve in oral fluids and come in contact with microvilli in the gustatory pore.
- The receptors are activated by the following ways

1) **Salt substances**– combine with receptors and stimulate Na+ influx through ENa channels. This leads depolarization and activation of the receptor cells.
2) **Sour substances** (organic and inorganic acids such as HCl,citric acid etc) – combine with receptors and cause H+ influx through ENaC channels. This leads depolarization and activation of receptor cells
3) **Sweet substances** (glucose, sucrose , fructose etc) – combine with receptors and increase intracellular cyclic AMP – this blocks K+ channels—**cause depol** and activation of receptor cells.
4) **Bitter substances** (alkaloids, quinine, morphine, nicotine etc) act through a G ptorein gustducin) and cause releasing of **Ca** from ER and thus increasing **intracellular Ca** .
5) **Umami** (monosodium glutamate) combine with glutamate receptor and increases Na and Ca influx –cause depolarization and activation of receptors.

- There are **5 primary taste sensations**, but 100 different tastes can be sensed by the tongue—by the combinations of these primary taste sensations

- Taste threshold ---is the minimum conc of the substance necessary to taste sensation. These threshold varies for different substances. Bitter has lowest threshold.
- A 30% change in conc of the substance being tasted is necessary before an intensity difference can be detected.
- **Factors influencing taste sensation**
- Area, duration ,temp etrc
- **Refer (Geetha text book)**
- **Abnormalities of taste sensations**
- **Ageusia**—absence of sense of taste---due to leision of facial nerve, glossopharyngeal nerve etc.
- **hypogeusia---**diminished taste sensitivity due to certain diseases, aging and tobacco abuse
- **Dysgeusia** …..altered taste sensation – usually in temporal lobe leision

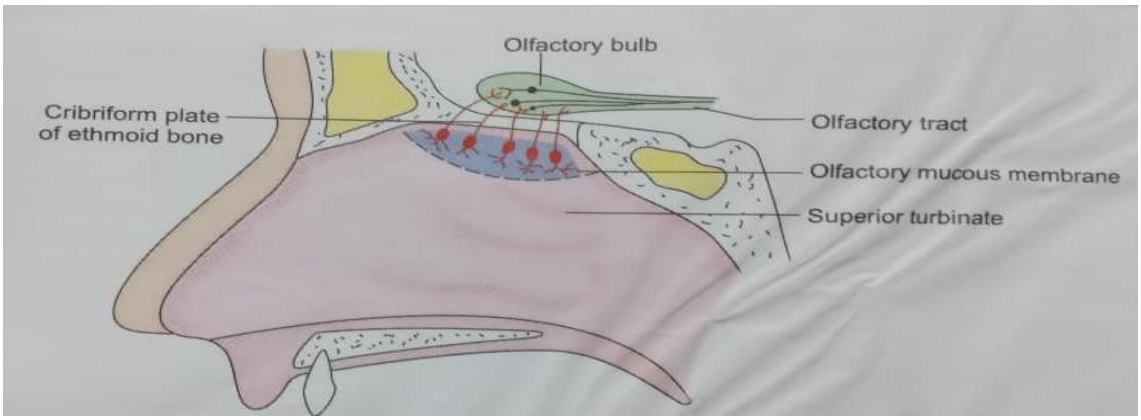
OLFACTION

Microsmatic animal –sense of smell is less developed—eg human being

Macrosmatic animal- " highly developed, eg insects. Dog etc

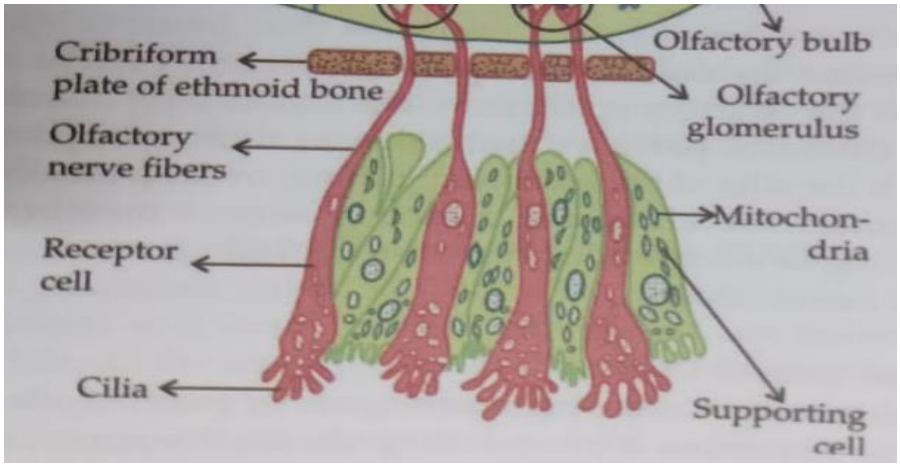
Functional anatomy

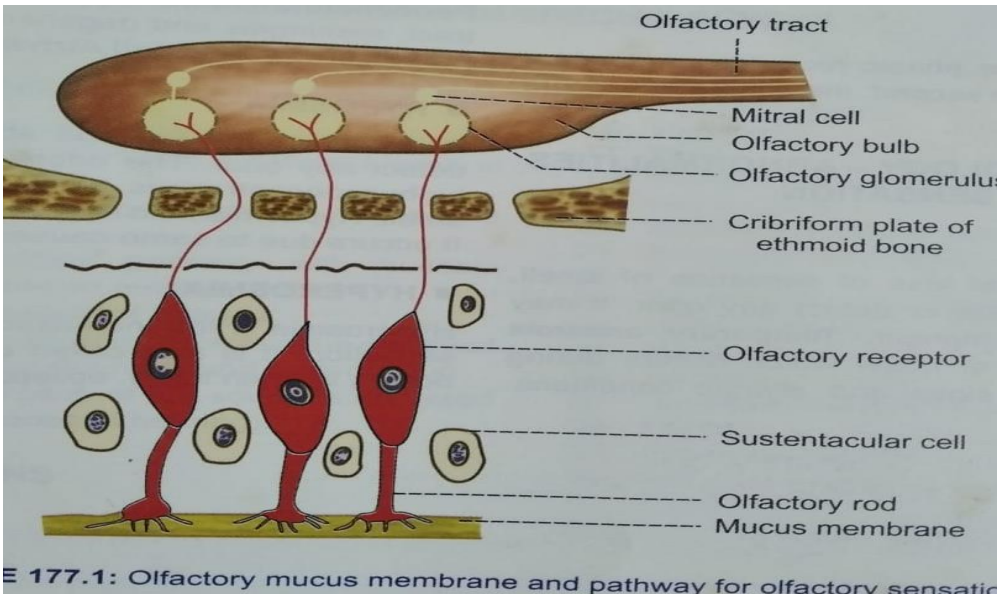
The olfactory receptors are located in a specialised portion of nasal mucosa called called **olfactory mucus membrane** which is located on roof of nasal cavity near septum.



Olfactory mucus memb consists of 3 types of cells

1 Olfactory receptor cells
2 Sustendacular or supporting cells
3 Basal cells

fig 

- 

E 177.1: Olfactory mucus membrane and pathway for olfactory sensatic

10-20 million olfactory receptors in man

- **Olfactory receptor is a bipolar neuron..**

Each receptor has a **cell body, an axon and a dendrite**

--The dendrites are short and thick with expanded ends-called **olfactory rods**.

-- From olf rod , cilia project to the surface of mucosa . cilia contain odorant receptor proteins , they bind with odor producing molecules (odorants) dissolved in mucus.

-- **The axons join to form olfactory nerves** , they pierce the cribriform plate of the ethmoid bone and end in **olfactory bulbs.**

---Supporting cells----give support to receptor cells—secrete mucus which covers the olf epithelium.

Basal cells –give rise to new receptor cells

Olfactory bulb

It is a synaptic unit . It contains :

Mitral cells

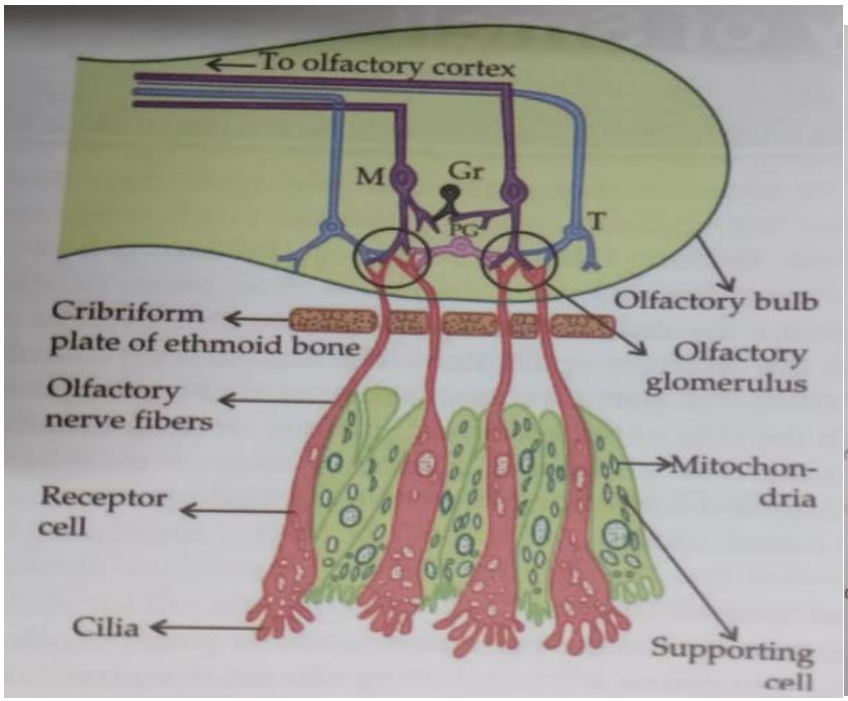
Tufted cells

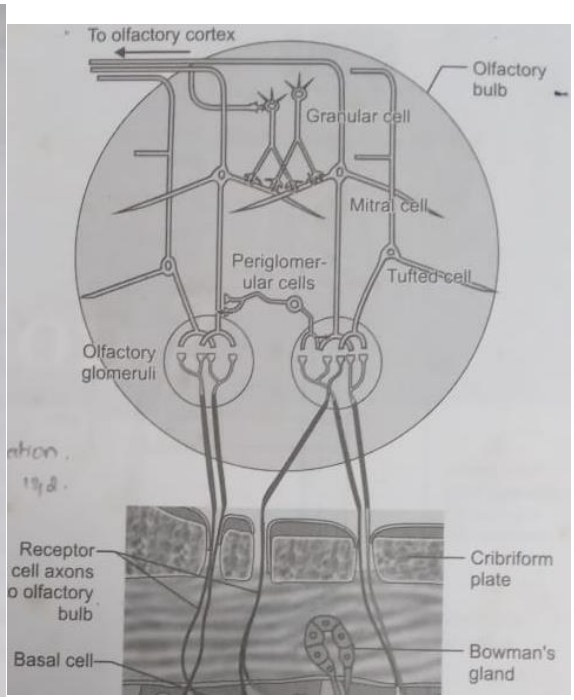
Granular cells

Periglomerular cells

In the olfactory bulb , the axons of the receptor cells synapse with primary dendrites of the Mitral and Tufted cells to form olfactory Glomeruli

Granular and periglomerular cells are inhibitory interneurons.





OLFACTORY PATHWAY

Olfactory receptors are bipolar neurons

1st order neuron is the bipolar neuron. cilia arise from dendrites of bipolar cells and they contain odorant receptor proteins

Axons penetrate the cribriform plate and reach the olfactory bulb.

In olfactory bulb the axons synapse with dendrites of Mitral and Tufted cells to form **Olfactory Glomeruli** (26000 olfactory axons converge on each glomerulus.

Mitral and Tufted cells constitute 2nd order neurons.

The axons of the mitral and tufted cells pass posteriorly through lateral olfactory stria to terminate on 5 regions of the olfactory cortex.

Anterior plfactory nucleus

Olfactory tubercle

Piriform cortex

Amygdala

Entorhinal cortex

From these regions informations travels directly to the frontal cortex or via the thalamus to the orbitofrontal cortex.

Intensity discrimination

Olfactory adaptation

Masking of odors

Applied aspect

Anosmia----complete absence of sense of smell

Parosmia—alteration in character of smell

Hyposmia—reduction in sense of smell due to damage to the olfactory mucosa or the olfactory pathways for trauma or diseases.

End end end end end