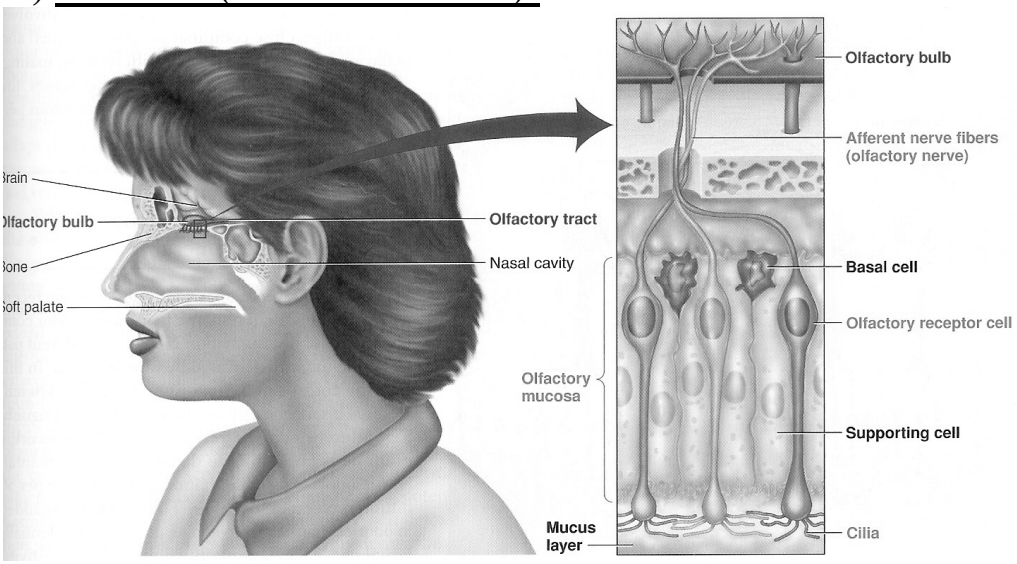
SPECIAL SENSES

- Hearing.
- Vision.
- Smell.
- Taste.

} They are closely related, e.g. common cold

A) SMELL: (called Olfaction):

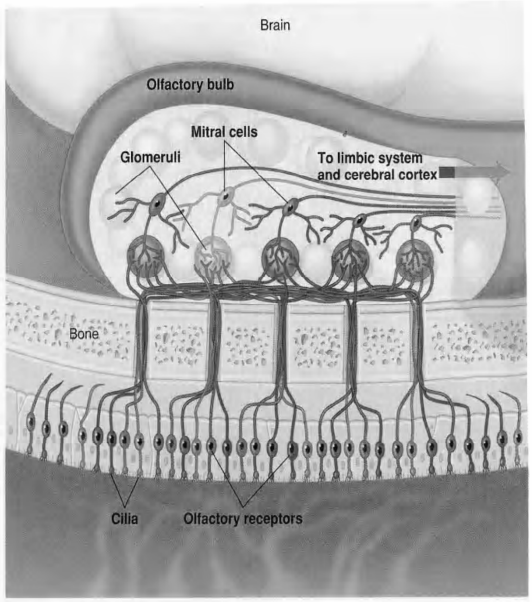


Anatomy:

- olfactory mucous: in the roof of nasal cavity near the septum.
- Contain olfactory receptors (bipolar neurons). **–MCQ-**
- Axons collected in bundles called fila olfactoria (olfactory nerve fiber).
- There are supporting cell –sustantacular cell- between the receptor, end in microvilli which secrete mucus.

Olfactory Pathway:

- Fila olfactoria enter olfactory bulb => synapse with mitral and tufted cell in the glomeruli of the bulb. **–MCQ-**
- From mitral cell , lateral and intermediate stria start => end on ipsilateral olfactory cortex and uncus.
- From tufted cells medial stria start then cross the midline and end on granular cells in opposite side (contralateral side).



N.B. olfactory tract transmits the signals to the brain to:

1-Olfactory Cortex.

Hippocampus.
Amygdale.
Hypothalamus.
} 2-Limbic system**-MCQ-** (which is involved in memory and behavior).

Physiology of Olfaction:

- Molecule dissolve in mucus layer (olfactory epithelium) => combine with receptors on cilia lead to:
  1- stimulation of adenylat cyclase by G-protein => increased intracellular cAMP => opening of Na channels (influx) **–MCQ-** => receptor potential => action potential in olfactory pathway (by depolarization).
  2- Acting through phospholipase C.

Facts: -MCQ-

- Human can recognize more 10000 smells. Animals can recognize more specially dogs.
- Adaptation can occur to pleasant and nasty smells due to changes both in receptors and central connection.
- (poorly developed in human)

Pathophysiology:

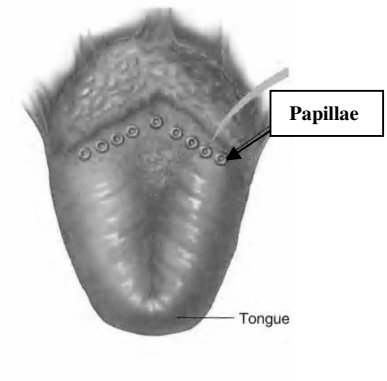
1- Anosmia:
- loss of smell sensation .
- due to damage to olfactory epithelium.
- Occurs in hypogonadism patient.

2- **Parosmia:** (dysosmia):
- alteration in smell sensation.
- Occurs in aging.
- e.g. in pregnant patient

3- Hyperosmia:
- increase smell sensation.
- In adrenal insufficiency.

4- Hyposomia:
- decrease in smell sensation.
- In vit. D deficiency
- In common cold.

B) TASTE (called Gastation):

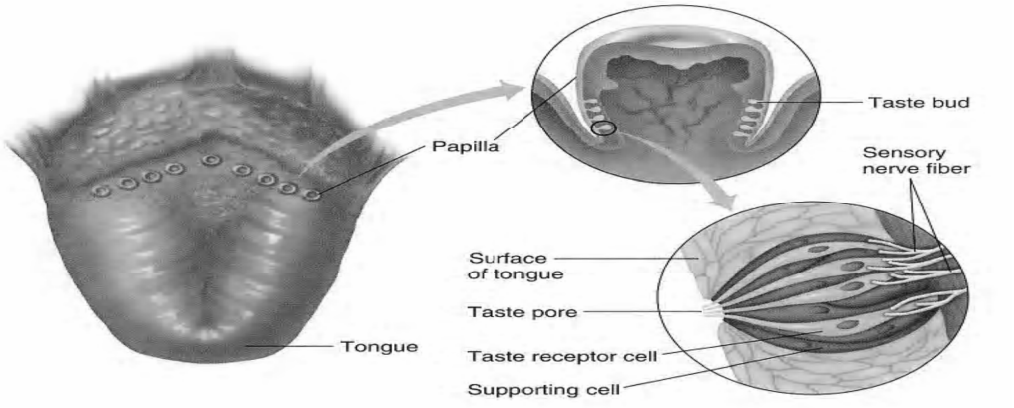


- Taste buds are specialized receptors in the oral cavity BUT mainly on the tongue, some on the palate. **–MCQ-**
- Taste is mainly function of taste buds, but receive: olfactory, tactile, visual, pain and thermal inputs.

- **Types of Papillae:**
  1- Filiform
  2- Fungiform.
  3- Foliate papillae.
  4- Circumvallate.

  - **NO** taste buds on the mid dorsum of the tongue => insensitive to taste.

Anatomy of Taste Buds:



- Gustatory cells with microvilli (gustatory hair). **–MCQ-**
- They are receptors cell with cilia **–MCQ-** projected through taste pore, in between there are supporting cell (sustantacular cells) => sensory organ.

** When taste buds are stimulated they produce nerve impulse to specific brain area through: **-MCQ-**

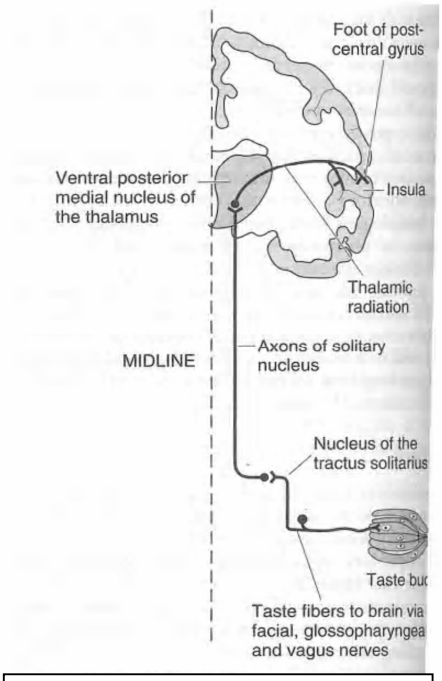
- Anterior 2/3 of the tongue => VII (facial nerve = lingual, chorda tympani).
- Posterior 1/3 of the tongue => IX (glossopharyngeal nerve).
- Receptors on the palate, pharynx, epiglottis => X (vagus).

Taste Pathway:

- **First order neuron: -**
  MCQ-
  taste fibers from the 3 cranial nerves from tractus solitarius => end in the nucleus of tractus solitarius (medulla).

- **Second order neuron:**
  from tractus solitarius cross the midline to ascend in medial lemnicus to the thalamus.

- **Third order neuron:**
  from thalamus project the cerebral cortex (post-central gyrus) through thalamic radiation.

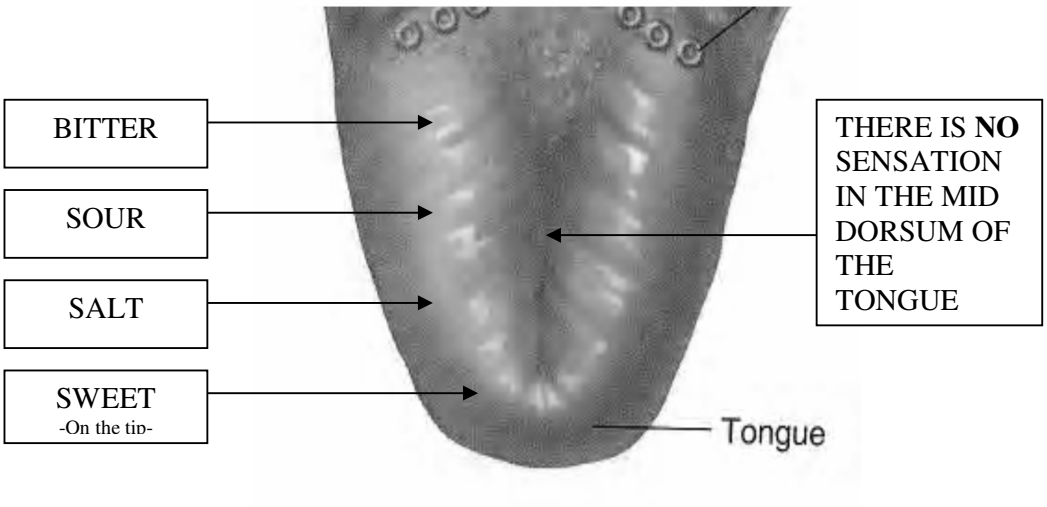


TASTE PATHWAY

Taste Sensation:

- Molecules dissolve in the saliva => attached to receptors on cilia of gustatory cells => receptor potential => AP.(due to CA channel)
- Combination between molecules and receptors is weak (since taste can be easily abolished by washing mouth with water).
- Sweet receptors respond to => sugar, saccharine, same A.A.
- Sour receptors respond to => H ions (acids).
- Salty receptors respond to => salt (NaCl).
- Bitter (e.g. coffee) respond to => quinine sulfate.
-

(N.B. this figure is V.IMP MCQ)



N.B. Bitter taste is most sensitive.
No sensation on mid dorsum.

Opening of ion channel of taste cells by: -MCQ-

1- **Acid (sour):** depolarize by H^+ gated channels.
2- **Na^+ salt**: via Na channels.
3- **Sugar + bitter**: by G-protein + 2nd messengers (IP_3 – DAG) gated ion channels.

Pathophysiology:

1- **Ageusia:**
complete loss of taste.

2- **Dysgeusia:**
disturbed taste.

3- **Hypogeusia:**
decreased taste sensation.

4- **Hypergeusia:**
increased taste sensation, adrenal insufficiency.