



Physiology of Taste & Smell



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- Further Explanation

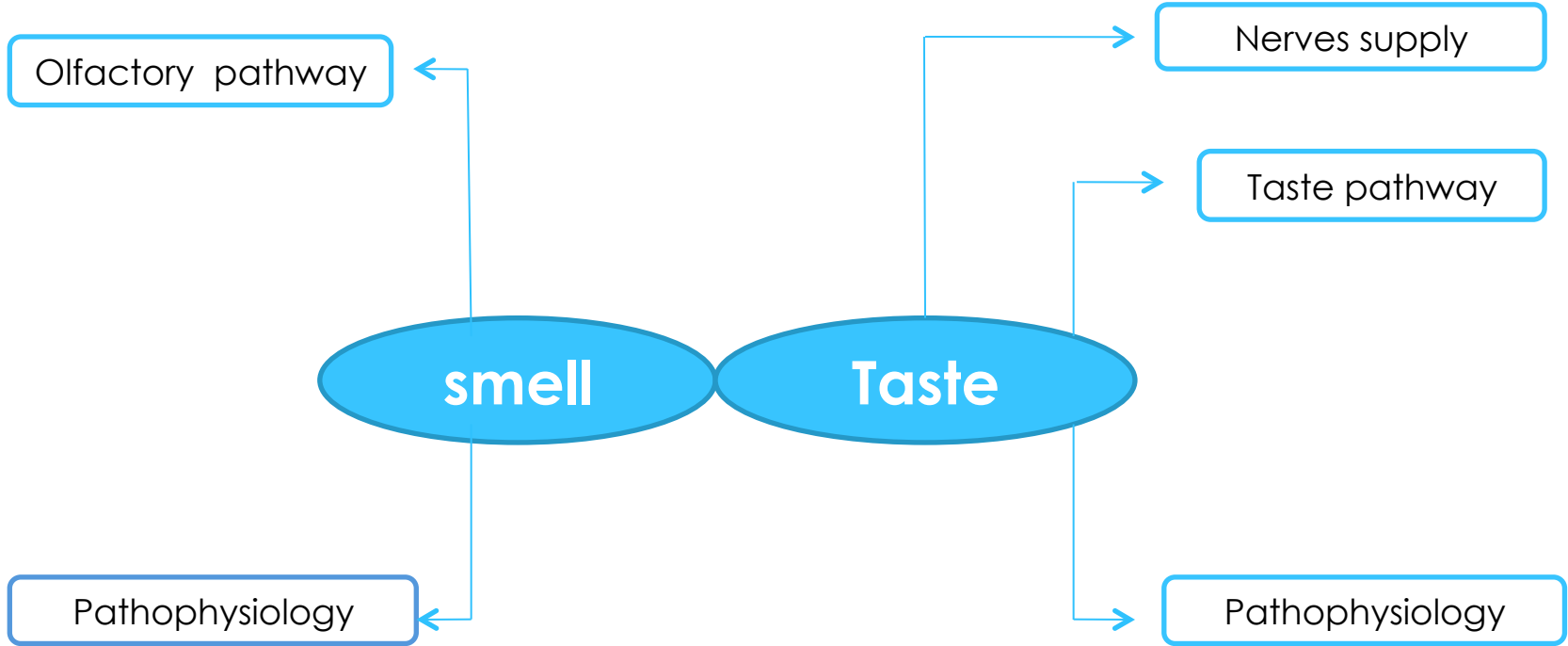
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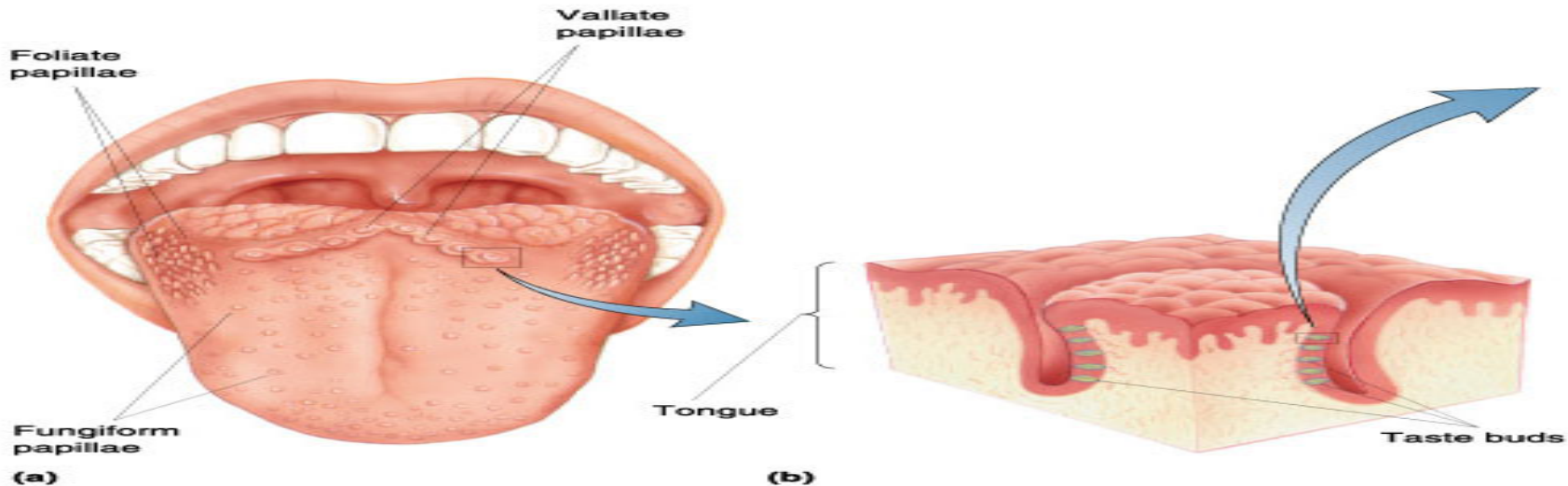


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Taste sensation

- ❖ It is a chemical sense and gives taste to food or non-food material.
- ❖ Substance to be tasted should either be in solution or diluted in saliva.
- ❖ Taste is received by **taste buds** which contain a huge number of taste receptors (gustatory receptors)
- ❖ We find these taste buds in a larger structure on the tongue called **papillae**, and in the mucosa of palate, epiglottis, pharynx.



Types of papillae :

Filliform

At most of the front two thirds of the tongue's surface.
Not contains taste buds.

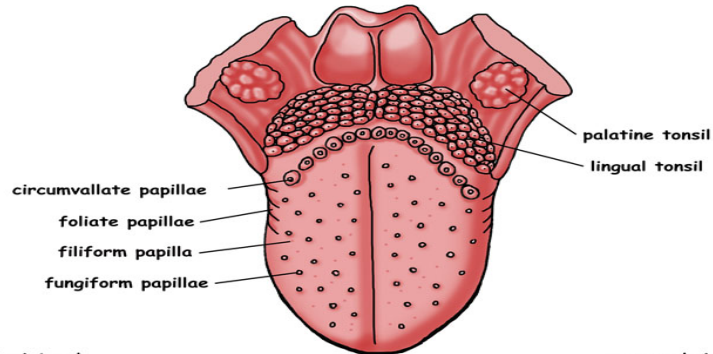
Fungiform

on the upper surface of the tongue

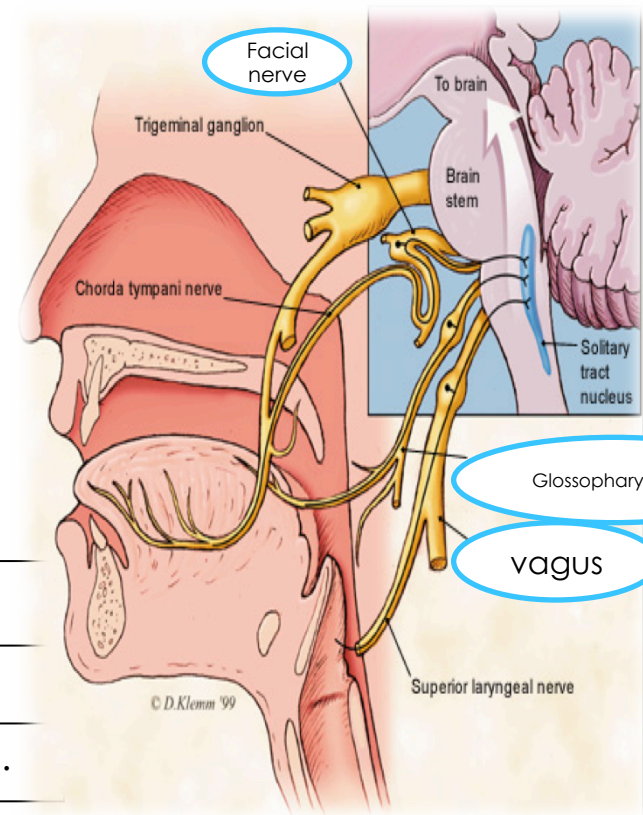
Circumvallate

in front of the foramen cecum.

Taste Buds and the Tongue



- ❖ Each taste bud contains too many “**Gustatory cells**”. Gustatory cells are cells with **microvilli** arise from its surface, in between there are supporting cells.
- ❖ These microvilli act as receptors for chemicals(food), to transmit an impulse to the brain.
- ❖ The Impulses are carried from Gustatory cells along the pathway of taste sensation through **3 Cranial Nerves**.



Facial nerve (VII)	the Anterior 2\3 of the tongue.
Glossopharyngeal	The posterior 1\3 of the tongue.
Vagus nerve (X)	Taste buds in pharynx, palate, epiglottis.

Note

we can't taste in the **mid dorsum** of the tongue because there is **No taste buds**.

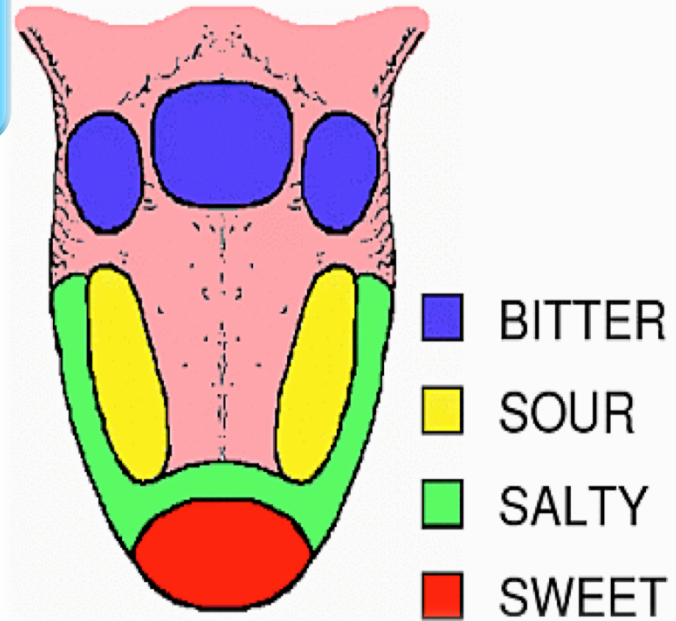
❖ There are **4 main tastes**, each is received in different places on the tongue.

Sweet On the tongue tip.
Mediated by{sugar, saccharide, Amino acids}

Sour On the tongue margins.
Mediated by{H ions, Acids}

Bitter In the back of tongue.
Mediated by{Alkaloids}

Salty Widely distributed.
Mediated by{salt, metals}



Note

- ❖ An additional taste flavor called (**Umami**), it's a mixture of more than one flavor. (e.g. **Meat**).
- ❖ Combination between molecules and receptors are **weak** (easily abolished by washing mouth with water).

Taste pathway

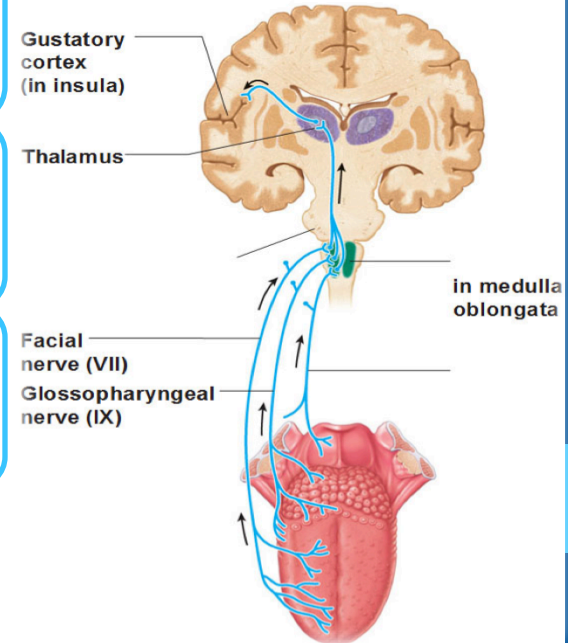
Chemicals(food) are dissolved in saliva. After that they stimulate the **microvilli** (cilia) of Gustatory cells to initiate an **Action potential**.

Taste centers:

1-Anterior insular cortex.

2- Operculum(in insula)

Gustatory Pathway



First order neuron

Taste fibres from the three cranial nerves(VII ,IX,X) carry electrical impulses, and form **tractus solitarius** in medulla oblongata .

Second order neuron

The axons of which cross the midline join the **medial lemniscus**, ending in Ventrobasal Complex of the Thalamus

Third order neuron

impulse arise from **thalamus** and project the **cerebral cortex** through thalamic radiation.

pathophysiological terms

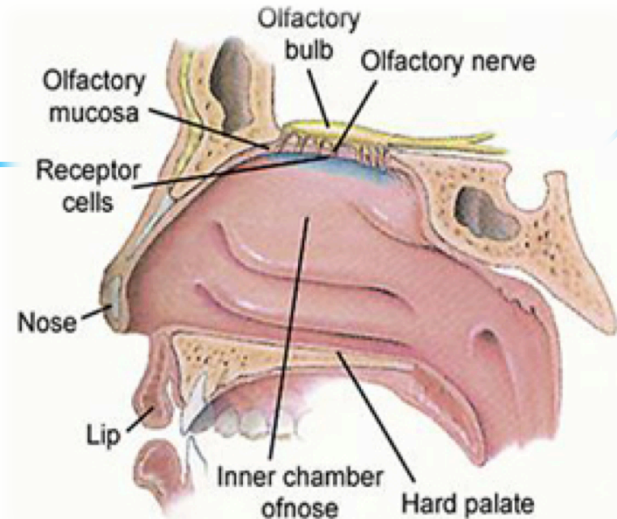
Ageusia	complete loss of taste.
Dysgeusia	disturbed taste (in some disease as a symptom)
Hypergeusia	Adrenal insufficiency , Due to parasympathetic dominance which leads to increase in saliva production
Hypogeusia	reduced taste sensitivity (e.g. Flu, drugs)

Smell sensation

- ❖ The nasal cavity divided into two segments: the **respiratory segment** and the **olfactory segment**.
- ❖ The olfactory segment is lined by special type of pseudo-stratified columnar epithelium called **olfactory epithelium**(olfactory mucous membrane) which contains **olfactory receptors**(bipolar neurone) for the sense of smell.
 - ❖ Olfactory segment is located **in the roof of the nasal cavity**.
 - ❖ The chemicals must be **dissolved** in the mucus to be detected.
- ❖ Impulses are transmitted via **olfactory nerve** to be interpreted in the olfactory cortex of the brain.
- ❖ Axons collected in bundles called **fila olfactoria**.

Note

Olfactory receptor neurons carry impulses **directly to the brain** without passing to thalamus.



- ❖ Human can differentiate between **2000-4000 odors**.
- ❖ When odorant molecules reach olfactory region, must interact with mucus overlying the receptor cells, and stimulate **adenylyl cyclase** that lead to increase intracellular cAMP result in opening of Na channels which leads to **Action potential**.
- ❖ **Adaptation** can occur to pleasant and nasty smells due to changes both in receptors and central connections.

Olfactory pathway :

- Fila Olfactoria** enters olfactory bulb to make synapses with **mitral & tufted cells**.
 - Impulses travel along the olfactory tracts to **the limbic system** .
 - interpreted in **the olfactory cortex** (Deep in temporal lobe & base of frontal lobe)

Fila Olfactoria: Axons collected in bundles.
the limbic system: Responsible for emotions & memory

	Strial type	Ending
Mitral cells	Lateral & intermediate stria	Ipsilateral cortex
Tufted cells	Medial stria	In granular cells (contralateral)

Pathophysiological terms :

Anosmia	loss of smell sensation. e.g. Cancer patient, tumor, trauma(due to damage to olfactory epithelium)
Parosmia (dysosmia)	Alteration in smell sensation. e.g. Hormonal effect(Pregnant)
Hyperosmia	increase in smell sensation. e.g. Adrenal insufficiency
Hyposomia	decreased smell sensation. e.g. Vitamin A deficiency , Common cold =flu

1- which is the nerve supply the Anterior 2/3 of the tongue?

- A. vagus
- B. glossopharyngeal
- C. facial
- D. Trigeminal

2-which is the type of papillae that does' contain taste buds ?

- A Fungiform.
- B. **Circumvallate**
- C. Filiform
- D. None

3- what is the part of the tongue that receive sweet ?

- A. Margins of tongue
- B. **back of tongue.**
- C. tongue tip
- D. All the tongue.

4-what is the term Ageusia?

- A. Complete loss of smell
- B. Complete loss of taste.
- C. Decrease in taste sensation.
- D. Decrease in smell sensation.

5- where the olfactory epithelium is located ?

- A. Floor of nasal cavity.
- B. Lateral aspect of nasal cavity.
- C. Roof of nasal cavity.
- D. Lined all the nasal cavity.

6- what is the term Hyperosmia ?

- A. Increase in taste sensation
- B. Increase in smell sensation
- C. Increase in hearing sensation.
- D. Loss of hearing.

- 1. C
- 2. C
- 3. C
- 4. B
- 5. C
- 6. B

1- WHAT ARE THE NERVES THAT related to taste buds ?

- . Facial nerve → anterior 2\3 of tongue
- glossopharyngeal nerve → posterior 1\3 of tongue
- vagus → palate, pharynx, epiglottis

2- mention two of smell disorders ?

- . Anosmia : complete loss of smell
- Hyposomia : decrease in smell sensation.**

3- what are the 4 main tastes ?

- . Sweet , salty , bitter , sour

4- How many odours that human can differentiate between ?

- .
- between 2000-4000 odours
- .

THANK YOU FOR CHECKING OUR WORK!

BEST OF LUCK

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