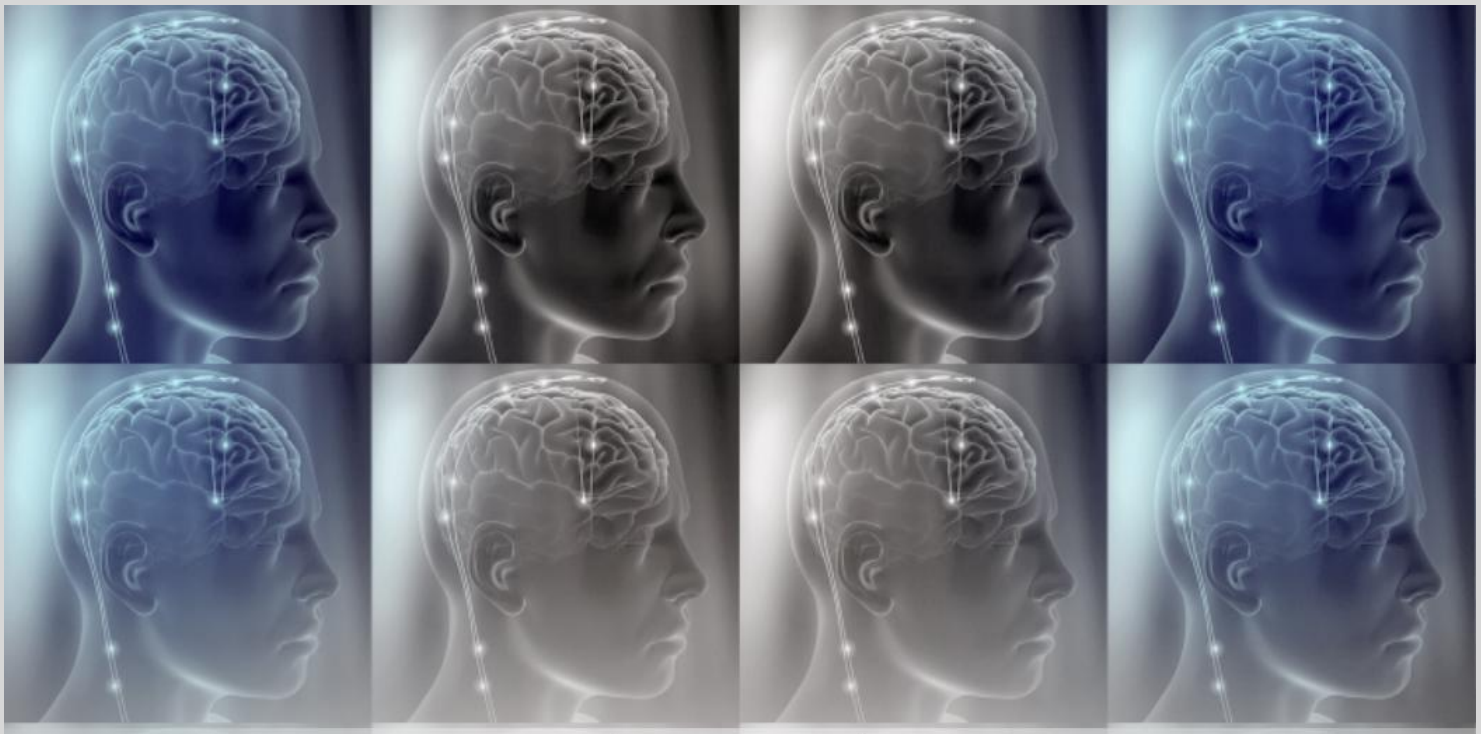

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CNS Central Nervous System

Block

Physiology Team

Taste

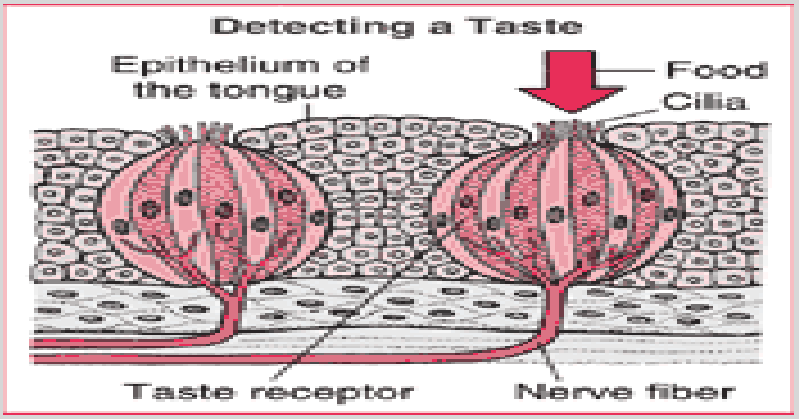
- Taste is chemical sense determine the flavour of food
- Taste and smell are closely linked even though they involve different receptors and receptive processes.
- This suggests an overlap in central processing.

Anatomy of Taste Sensation

Taste buds

Receptors:

- Located in taste buds in:
  - Tongue (mainly)
  - Epiglottis
  - Soft Palate
  - Pharynx

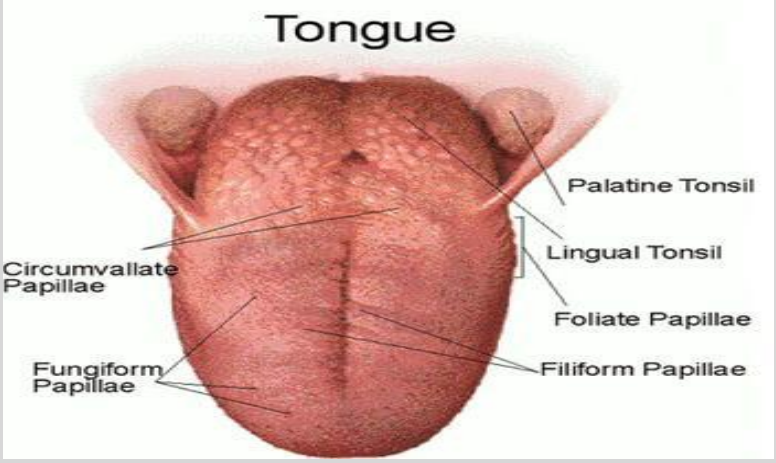


Anatomy of Taste Buds

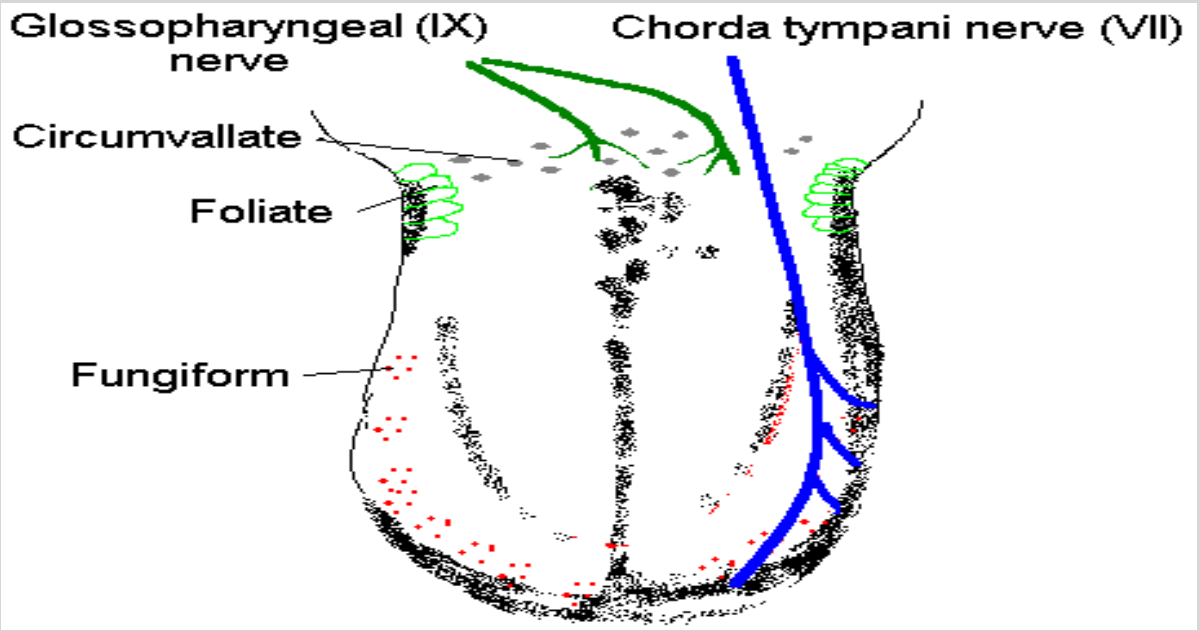
- Taste bud : gustatory cells with microvilli (gustatory hair)
- They are receptors cells with cilia projected through taste pore in between there are supporting cells
- 10,000 taste buds found on tongue, soft palate & larynx
- Taste buds consist of:
  - ~50 receptor cells surrounded by supporting cells
    - Gustatory hairs project through the taste pore
    - Life span of 10 days
  - Basal cells develop into supporting cells then receptor cells

Types of papillae (projection)

- Filiform
- Fungiform
- Circumvallate
- No taste buds on the mid dorsum of the tongue



Nerve supply of tongue

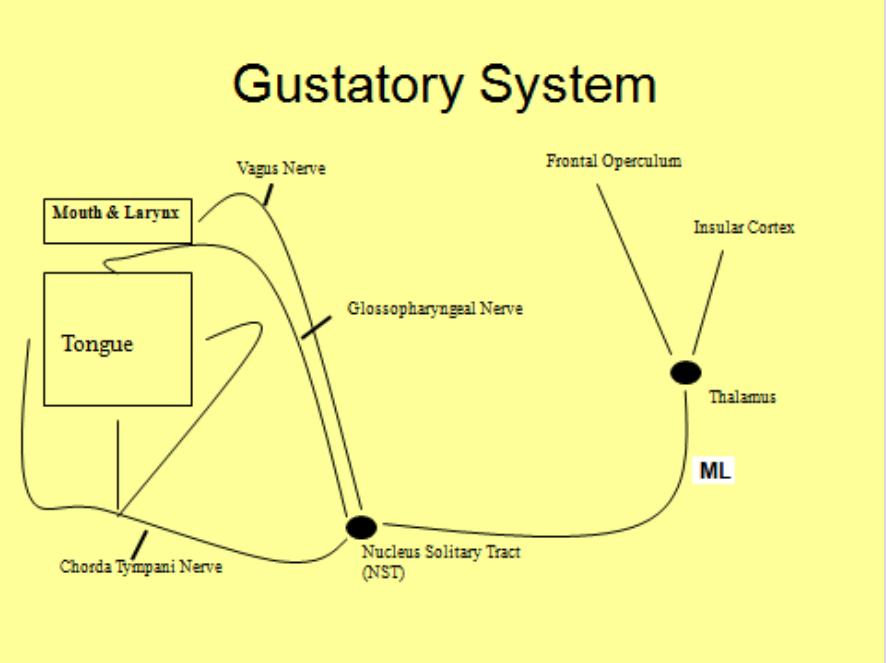


- **Taste buds When stimulated produce nerve impulse to specific brain area through:**
  - **Anterior 2/3 of the tongue »»»»»» VII**
  - **Posterior 1/3 of the tongue »»»»»» IX**
  - **Receptors on the palate, pharynx, epiglottis »»»»»» X**

Taste information is send to the CNS by the nerve #7, 9 and 10 to the taste nucleus (n. solitarius); from there to thalamus and insular cortex

Taste pathway

- First order neurone:
  - Taste fibres from the three cranials nerves form tractus solitarius »»»»»» end in the nucleus of tractus solitarius (medulla)
- Second order neurone:
  - From TS cross the midline to ascend in the medial lemniscus to the thalamus
  - Third order neuron:
  - from thalamus project the cerebral cortex through thalamic radiation



Taste sensation

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

- **Combination between molecules and receptors are week (since taste can be easily abolished by washing mouth with water)**

Primary modalities of taste:

- **Sour**
- **Salt**
- **Sweet**
- **Bitter**
- **umami (deliciousness), a taste associated with glutamate & other nucleotides has receptors located at the back of the pharynx.**

Distribution of taste buds on tongue not uniform

- **sweet - tongue tip**
- **sour - tongue margins**
- **bitter - back of tongue**
- **salt - widely distributed**

- Sensitivity differs in different areas, but all tastes can be perceived at most areas of the tongue

Evidence for 4 modalities:

1. Cocaine on the tongue:

Sensations disappear in the following order

Pain → sweet → sour → Bitter → salt → touch

2. Gymnemic acid on tongue:
    - Bitter & sweet → disappear
    - Sour & salt → remain

Chemical structure and taste

- Sour ... Acidity by $\{H^+\}$ – HCL ..pH = 3.5
- Salt ... Sodium chloride ..... 0.02 M
- Sweet ..Sucrose ..... 0.01 M
- Bitter .. Quinine Sulphate ..0.000000M

Artificial sweeteners

Saccharine, Cyclamates, Aspartame

Mechanism of stimulation of taste sensation:

- **Sour taste:**

Acids (H^+) → Blocks K^+ channels → Depolarization

Sourness receptors operate by closing potassium channels, which allows a positive charge to build up, thereby causing depolarization of the cell.

- **Salt taste**

Na^+ influx → Depolarization

Saltiness or sodium receptors allow sodium ions to cross the membrane, thereby causing depolarization.

- **Sweet taste**

G protein → activation of adenyl cyclase → increase c-AMP → decrease K conductance → Depolarization

- **Bitter taste**

  G protein → Activatn of Phospholipase C → increase IC-insitol $(PO_4)3$ → Ca_2 release

Saltiness and sourness are transduced directly by sodium and hydrogen ions respectively.

The transduction process for sweetness and bitterness involve second messengers.

Discrimination of intensity of taste:

- **Poor (like smell)**
- **Requires 30% change to allow discrimination of intensity**

Adaptation to taste:

Decreased sensation from repeated stimulus

Entirely peripheral at the receptors

- **Ageusia: Absence of sense of taste**
- **Dysgeusia: Disturbed sense of taste**
- **Hypogeusia: Diminshed sense of taste**
- **Hypergeusia: increased sense of taste**

  In adrenal insufficiency → hyponatremia → Increased taste sensation