HUMAN ANATOMY AND PHYSIOLOGY-1(BP101T)

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UNIT: 4 SPECIAL SENSES

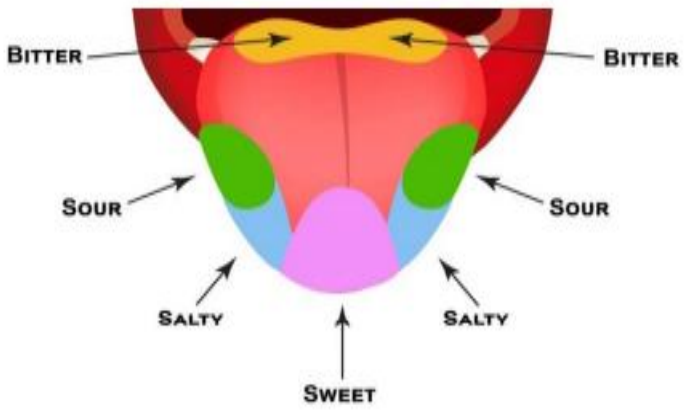
CLASS: 8

TOPIC: STRUCTURE AND FUNCTIONS OF TONGUE AND ITS DISORDERS

Gustation, or taste, is a chemical sense.

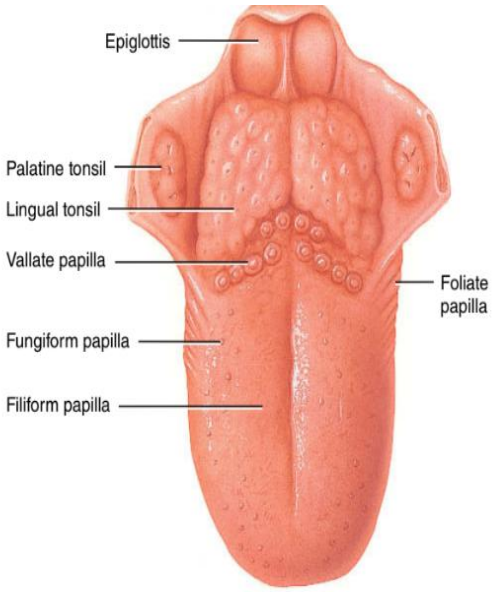
It consists of five primary tastes:

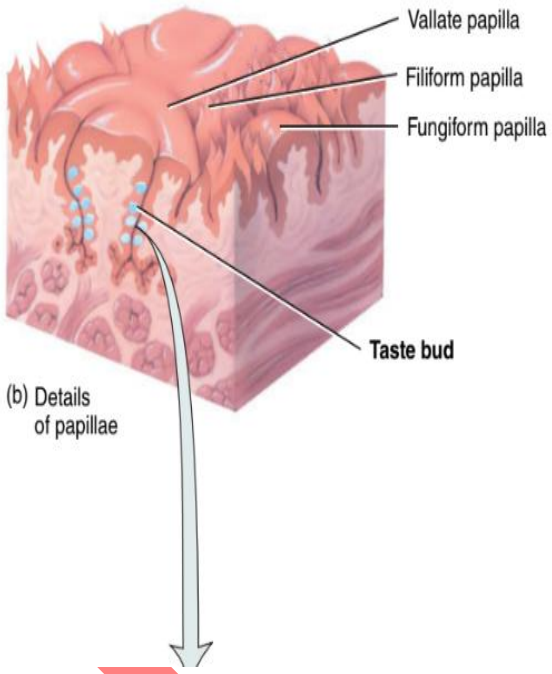
- Sour



- Sweet
- Bitter
- Salty
- Umami

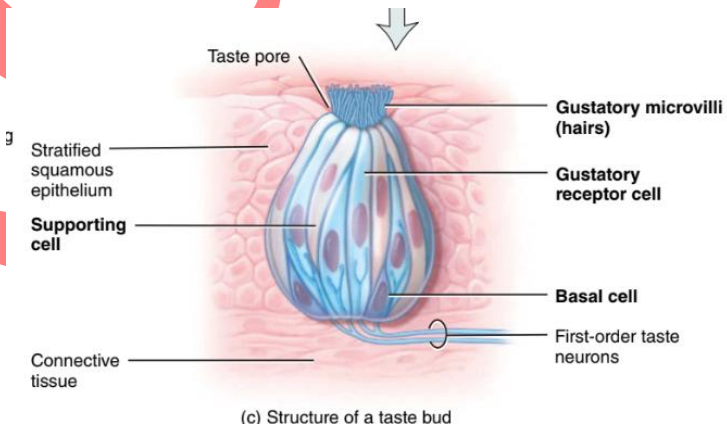
The umami taste recently reported and is described as meaty taste. Odours from food can pass upward from the mouth into the nasal cavity, where they stimulate olfactory receptors. Because olfaction is much more sensitive than taste, a given concentration of a food substance may stimulate the olfactory system thousands of times more strongly than it stimulates the gustatory system.





ANATOMY OF TASTE BUDS AND PAPILLAE:

The receptors for sensations of taste are located in the **taste buds**. Nearly **10,000** taste buds are present on the tongue of a young adult, but some are found on the soft palate, pharynx and epiglottis. The number of taste buds declines with age.



Each taste bud is an oval body consisting of three kinds of epithelial cells:

(a) SUPPORTING CELLS: The supporting cells surround about 50 gustatory receptor cells in each taste bud.

(b) GUSTATORY RECEPTOR CELLS: A single, long microvillus, called a gustatory hair, projects from each gustatory receptor cell to the external surface through the taste pore (opening in the taste bud).

(c) BASAL CELLS: Basal cells, stem cells found at the periphery of the taste bud near the connective tissue layer, produce supporting cells, which then develop into gustatory receptor cells. Each gustatory receptor cell has a life span of about 10 days.

At their base, the gustatory receptor cells synapse with dendrites of the first-order neurons that form the first part of the gustatory pathway. Taste buds are found in elevations on the tangue called **papillae** which provide a rough texture to the upper surface of the tongue. Four types of papillae contain taste buds.

(a) Circumvallate papillae: It form an inverted V-shaped row at the back of the tongue. Each of these papillae houses 100-300 taste buds.

(b) Fungiform papillae: These are mushroom-shaped elevations scattered over the entire surface of the tongue that contain about 5 taste buds each.

(c) Foliate papillae: These are located in small trenches on the lateral margins of the tongue, but most of these taste buds degenerate in early childhood.

(d) Filiform papillae: In addition, the entire surface of the tongue has filiform papillae. These pointed, threadlike structures contain tactile receptors but no taste buds. They increase friction between the tongue and food, making it easier for the tongue to move food in the oral cavity.

PHYSIOLOGY OF GUSTATION: Chemicals that stimulate gustatory receptor cells are known **as tastants.** Once a **tastant is dissolved in saliva,** it can make **contact with the plasma membrane of the gustatory hairs,** which are the sites of **taste transduction**. The result is a receptor potential that stimulates **exocytosis** of

synaptic vesicles from the gustatory receptor cell. The liberated neurotransmitter molecules trigger nerve impulses in the first-order sensory neurons that synapse with gustatory receptor cells. The receptor potential arises differently for different tastants. The sodium ions (Na) in a salty food enter gustatory receptor cells via Na* channels in the plasma membranes. The accumulation of N at inside causes depolarization that leads to release of a neurotransmitter. The hydrogen ions (H*) in sour tastants may flow into gustatory receptor cells via H* channels. They also influence opening and closing of other types of ion channels. Again, the result is depolarization and the liberation of the neurotransmitter. Other tastants, responsible for stimulating sweet, bitter, and umami tastes, do not themselves enter gustatory receptor cells. Rather, they bind to receptors on the plasma membrane that are linked to G proteins. The G proteins then activate several different chemicals known as second messengers inside the gustatory receptor cell. Different second messengers cause depolarization in different ways to release the neurotransmitter.

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