

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



THE SENSATION OF TASTE

BY DR SARAH SHAHID



Overview

- ▶ Learning objectives.
- ▶ Introduction to taste
- ▶ Primary taste sensations
- ▶ 5 taste modalities
- ▶ Types of Taste Papillae
- ▶ The taste Buds
- ▶ Mechanism of stimulation of Taste buds

Learning objectives

by the end of this class, the second year students should be able to:

- ▶ Describe the basic 5 taste modalities.
- ▶ Describe the different types of Lingual Papillae.
- ▶ Describe the location and structure of taste buds.
- ▶ Mention the factors influencing taste sensations.

The Gustatory System

The gustatory system is a highly specialized system for reception and processing of the sense of taste. It consists of:

- ▶ **The taste buds**, which are the peripheral receptors of taste stimuli
- ▶ **The gustatory pathway** for transmission of gustatory impulse and
- ▶ **The cortical centers** implicated in gustatory functions.

Sense Of Taste

Mainly a function of taste buds in mouth, but one's sense of smell also contributes strongly to taste perception

It allows a person to select food according to desires and often in accord with the body tissues metabolic need for special substances

Taste and Smell

- ▶ The senses of taste and smell allow us to separate undesirable or even lethal foods from those that are pleasant to eat and nutritious
- ▶ Both senses are strongly tied to primitive emotional and behavioral functions of our nervous system

Primary Taste Sensations

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At least 13 possible chemical receptors in the taste cells, as follows:

- 2 SODIUM RECEPTORS,
- 2 POTASSIUM RECEPTORS,
- 1 CHLORIDE RECEPTOR,
- 1 ADENOSINE RECEPTOR,
- 1 INOSINE RECEPTOR,
- 2 SWEET RECEPTORS,
- 2 BITTER RECEPTORS
- 1 GLUTAMATE RECEPTOR,
- 1 HYDROGEN ION RECEPTOR

Primary Taste Sensations

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- ▶ Five primary taste categories
- ▶ A person can perceive hundreds of different tastes
- ▶ They are all supposed to be combinations of the elementary taste sensations

*What are the five basic
Taste Sensations ???*



Sweet Taste

- Sugars
 - Glycols
 - Alcohols
 - Aldehydes
 - Ketones
 - Amides
 - Esters
 - Some Amino Acids, some small proteins
sulfonic acid, halogenated acids, and
inorganic salts of lead and beryllium
- Most of these are **Organic chemicals**





Salty Taste

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- ▶ Elicited by **ionized salts**, mainly by the **sodium** ion concentration
- ▶ Quality of taste varies somewhat from one salt to another, because some salts elicit other taste sensations in addition to saltiness
- ▶ Cations of salts, especially sodium cations, are mainly responsible for the salty taste, but anions also contribute to a lesser extent





Sour Taste

- ▶ The sour taste is elicited by **acids**, mainly by **hydrogen ion concentration**
- ▶ The intensity of this taste sensation is approximately proportional to the logarithm of the hydrogen ion concentration





Bitter Taste

Substances giving bitter taste are almost entirely organic substances

- **Long-chain organic substances** containing **nitrogen**
- **Alkaloids** → many drugs used in medicines, such as Quinine, Caffeine, Strychnine, and Nicotine

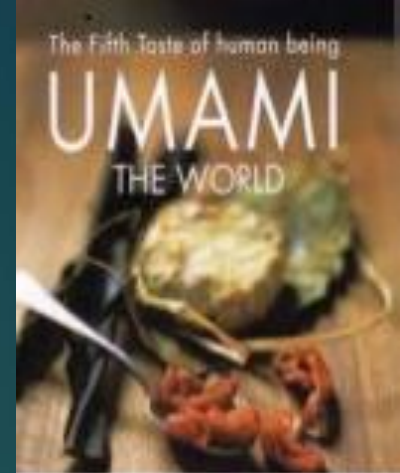


CHICKEN TIKKA

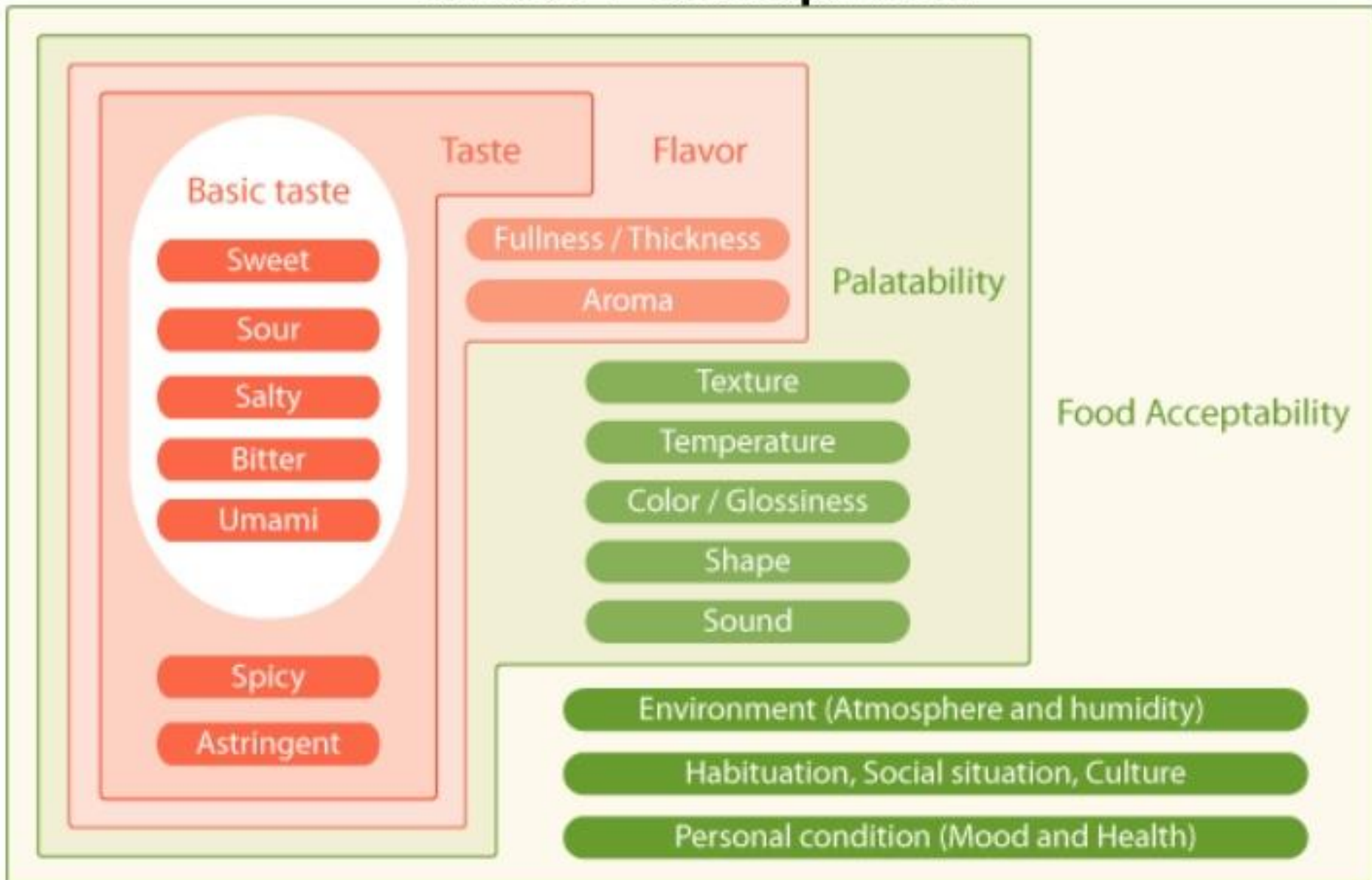


Umami Taste

- ▶ A Japanese word , meaning “delicious”
- ▶ Dominant taste of food containing salts of glutamic acid like **monosodium glutamate** a flavour enhancer used in many processed foods and in many Asian dishes
- ▶ The taste of amino acids. Processed meat and cheeses also contain glutamate
- ▶ The precise molecular mechanisms responsible for umami taste are still unclear

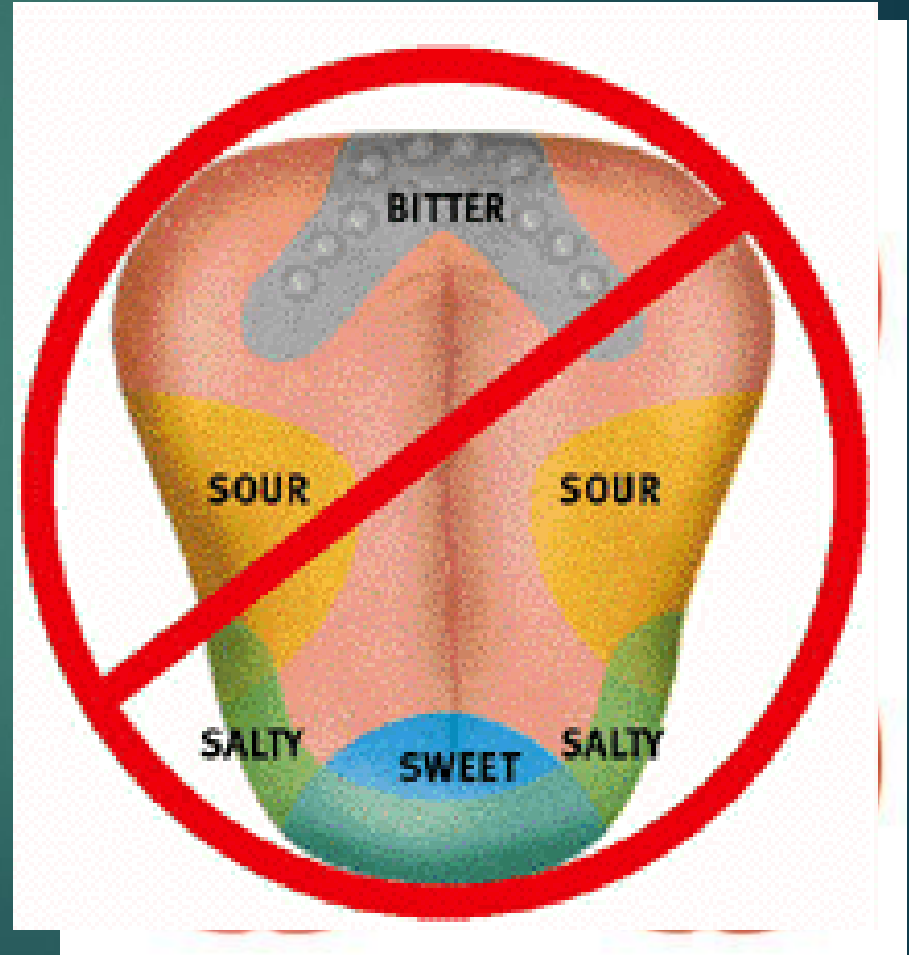
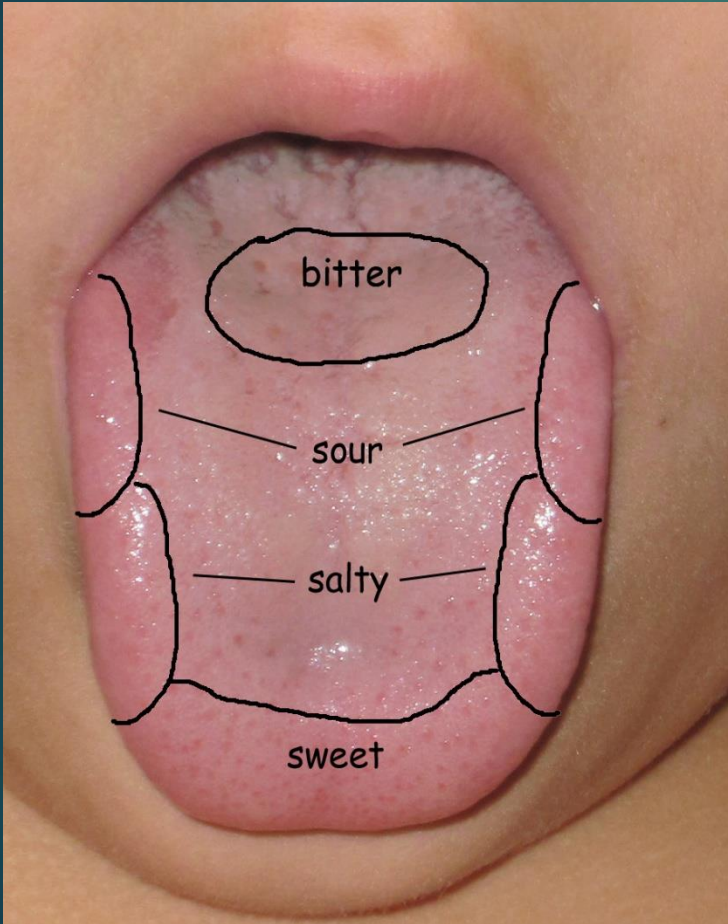


Taste Perception



Distribution Of Primary Taste Receptors On Tongue

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The New Tongue Map

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Sweet



Sour



Salty

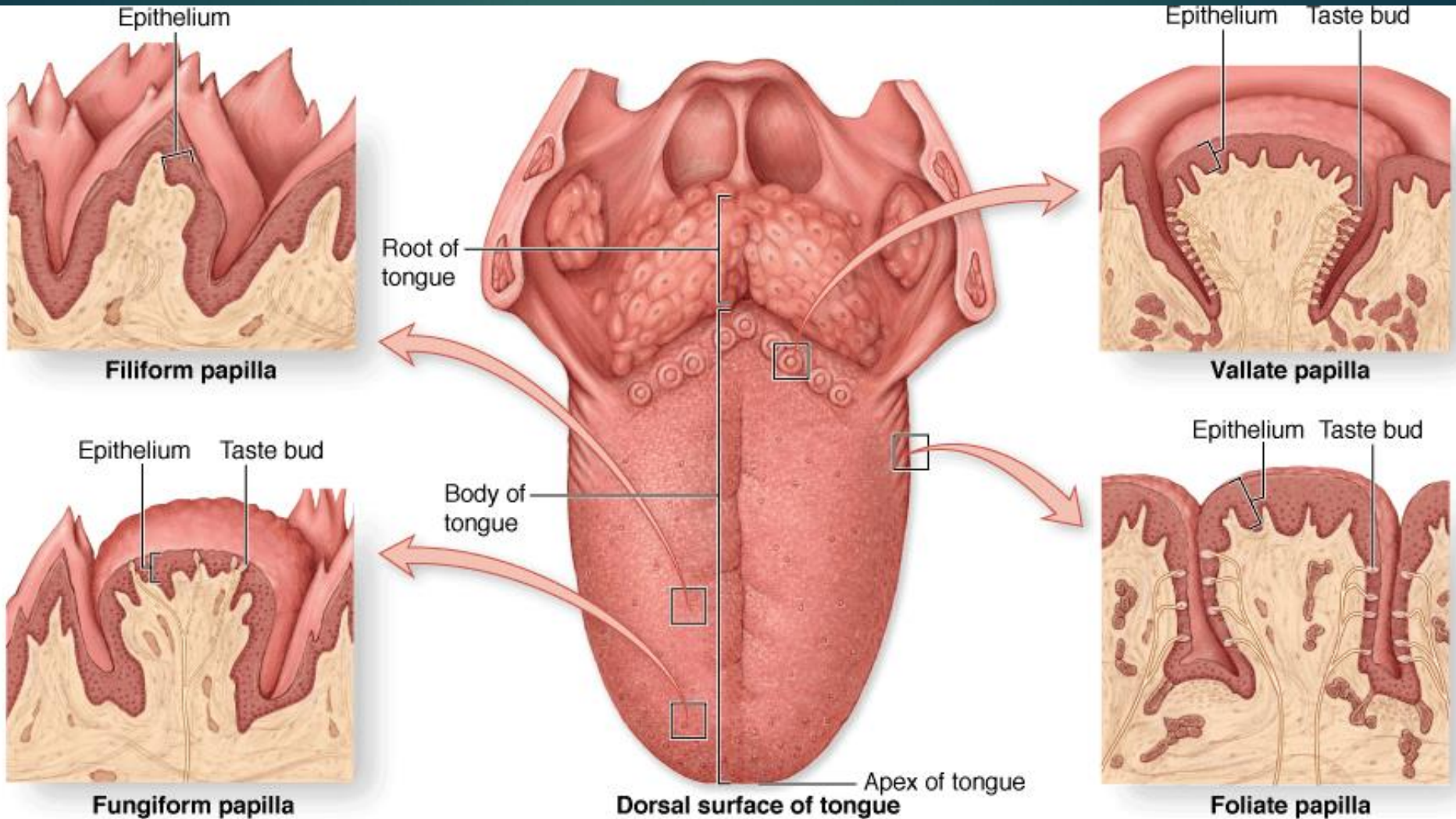


Bitter

*All tastes can be perceived equally well everywhere on the tongue.
People used to think that there were specific zones for sweet, sour, salty and bitter –
but this has been proven to be wrong.*

The lingual papillae

4 Types Of Lingual Pappillae 25



FUNGIFORM

- are rounded structures
- most numerous near the tip of the tongue.
- 5 taste buds per papilla
- located at the top of the papilla



CIRCUMVALLATE PAPILLAE

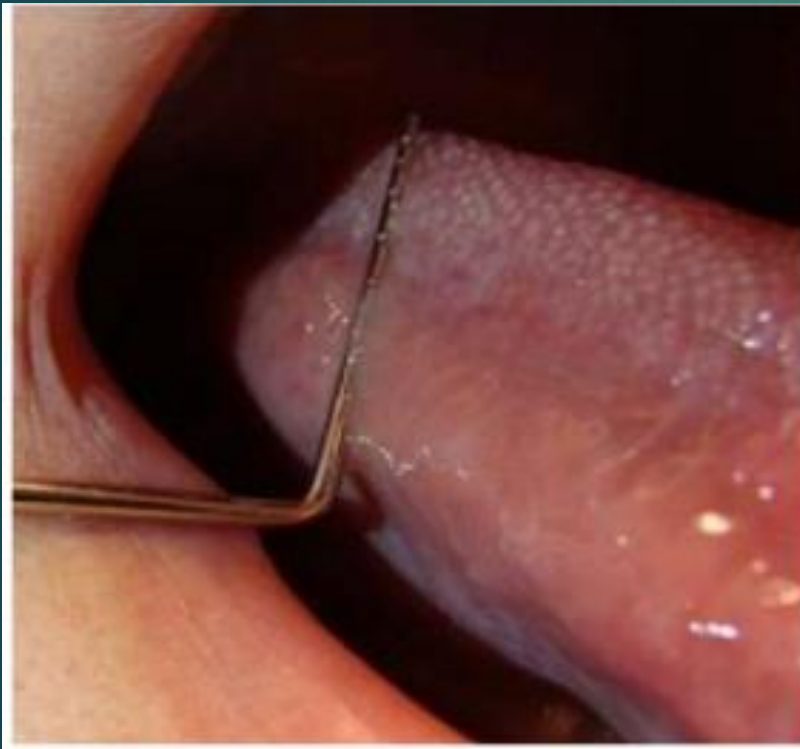
- are prominent structures arranged in a V on the back of tongue
- 6-12 in no.
- contain up to 100 taste buds each usually along the sides



FOLIATE PAPILLAE

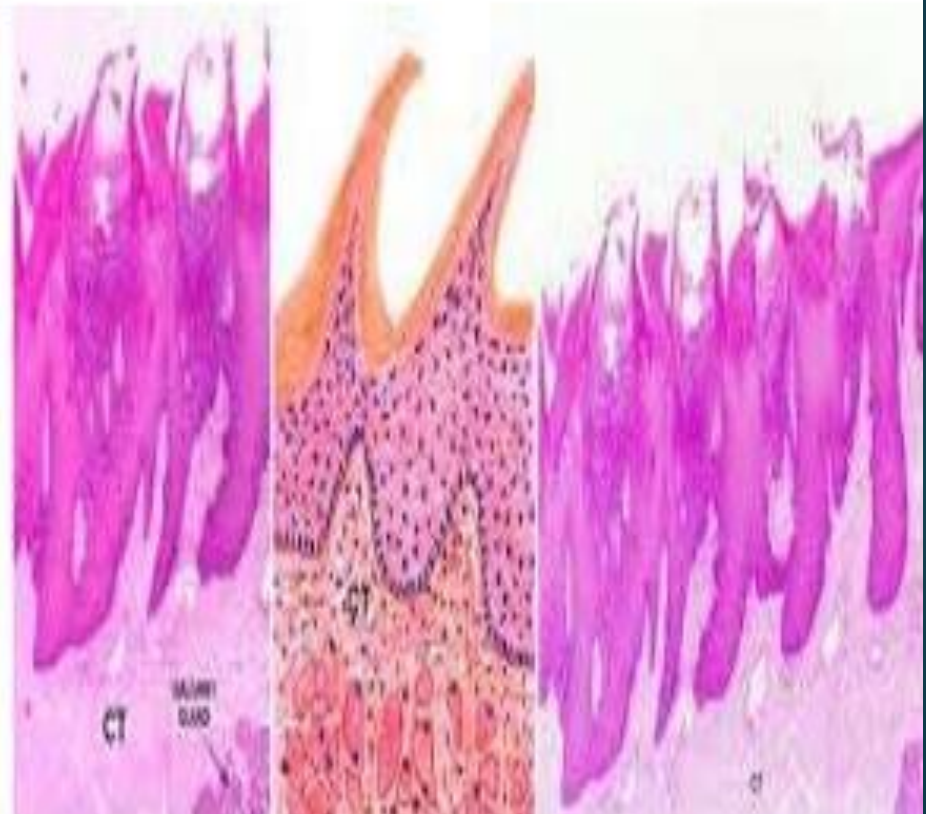
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are ridges or grooves towards posterior part of mouth on lateral margins → best-developed in young children



FILIFORM PAPILLAE

Cover the dorsum of the tongue and do not usually contain taste buds and are most numerous → provide friction to help move food during chewing



BASIC TASTE SENSATIONS

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	PRODUCED BY	MECHANISM OF STIMULATION	SENSITIVE PART OF TONGUE
SWEET	Sugars, glycols & aldehydes.	↑ cyclic AMP → ↓K ⁺ conductance	Tip
BITTER	Alkaloids	↑ IP ₃ → ↑Ca ⁺⁺ release	Posterior
SOUR	H ⁺ ions	Blocking K ⁺ channels	Postero lateral 1/2
SALT	Anions of ionised salts	↑ Na ⁺ ion permeability	Antero lateral 1/2
UMAMI	Monosodium glutamate	Stimulates glutamate Receptor mGluR4	—

Taste Bud And Its Function

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A total of 10,000 taste buds on the human tongue.

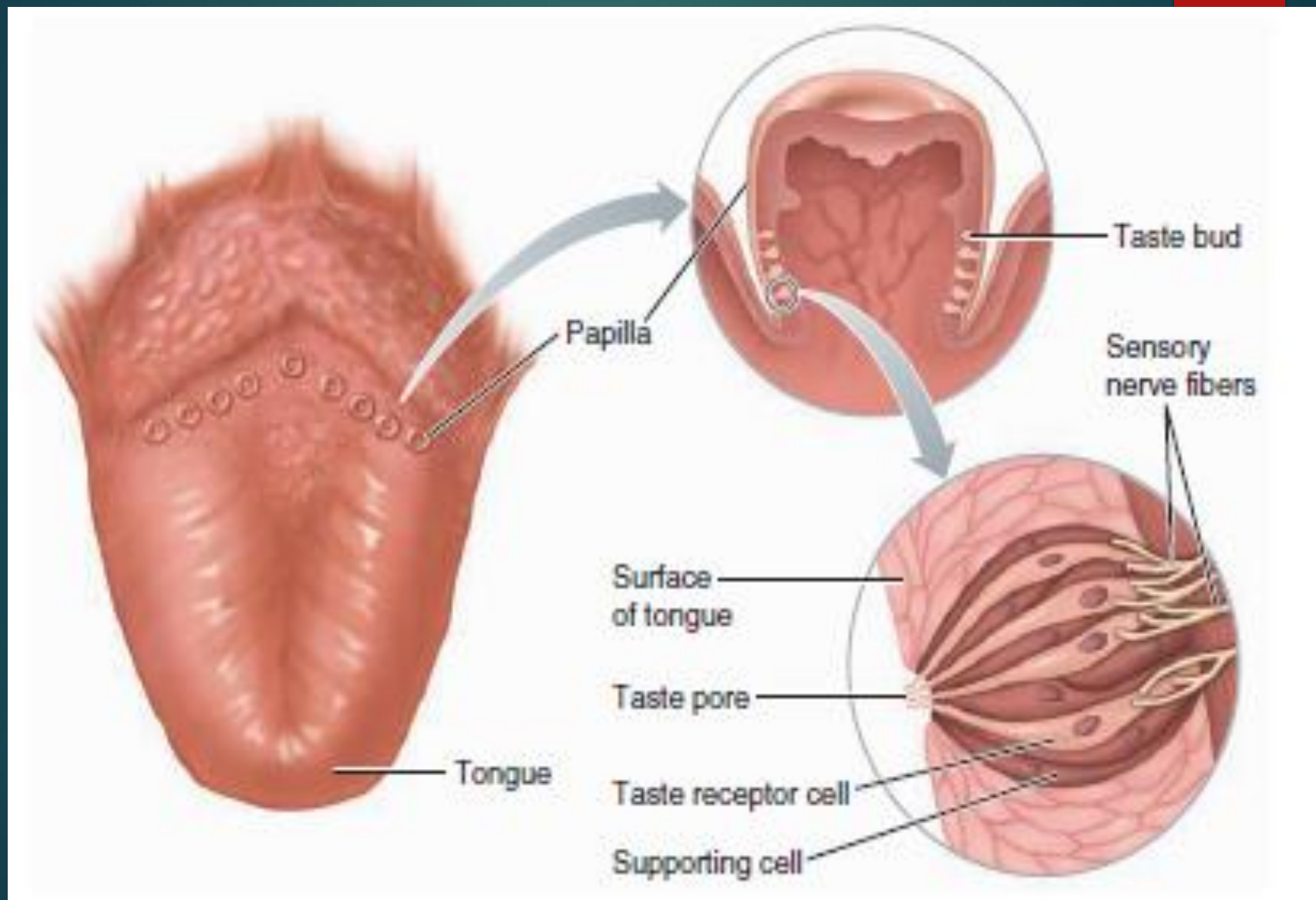
Has a diameter of about $\frac{1}{30}$ millimeter and a length of about $\frac{1}{16}$ millimeter

Composed of about 50 modified epithelial cells, some of which are supporting cells called **sustentacular cells** and others are **taste cells**

Taste cells are continually being replaced by mitotic division of surrounding epithelial cells

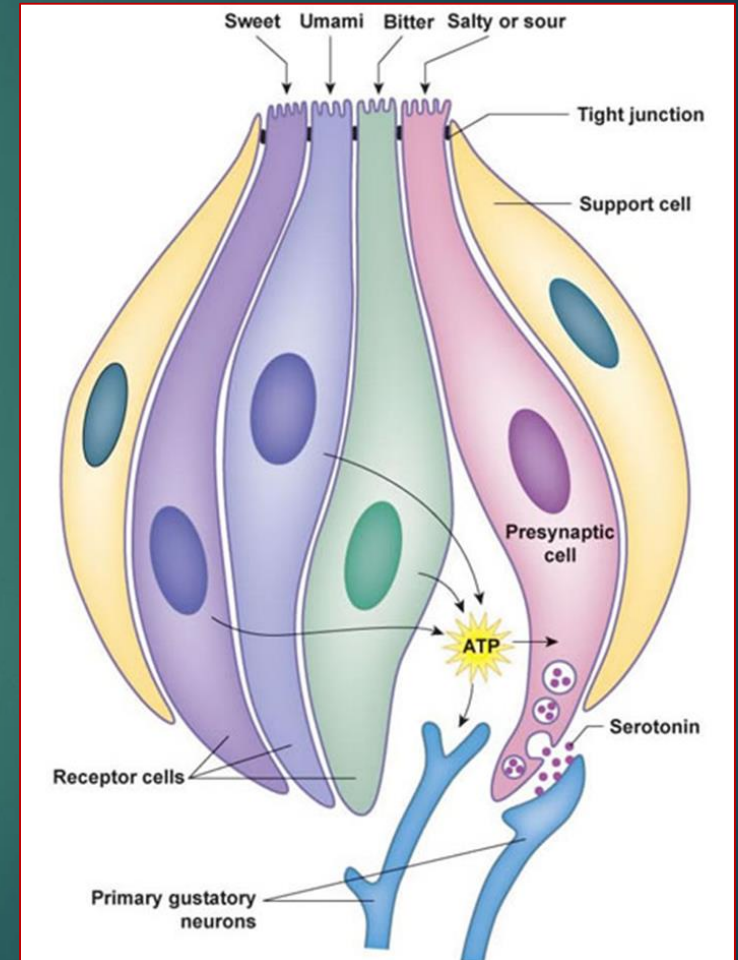
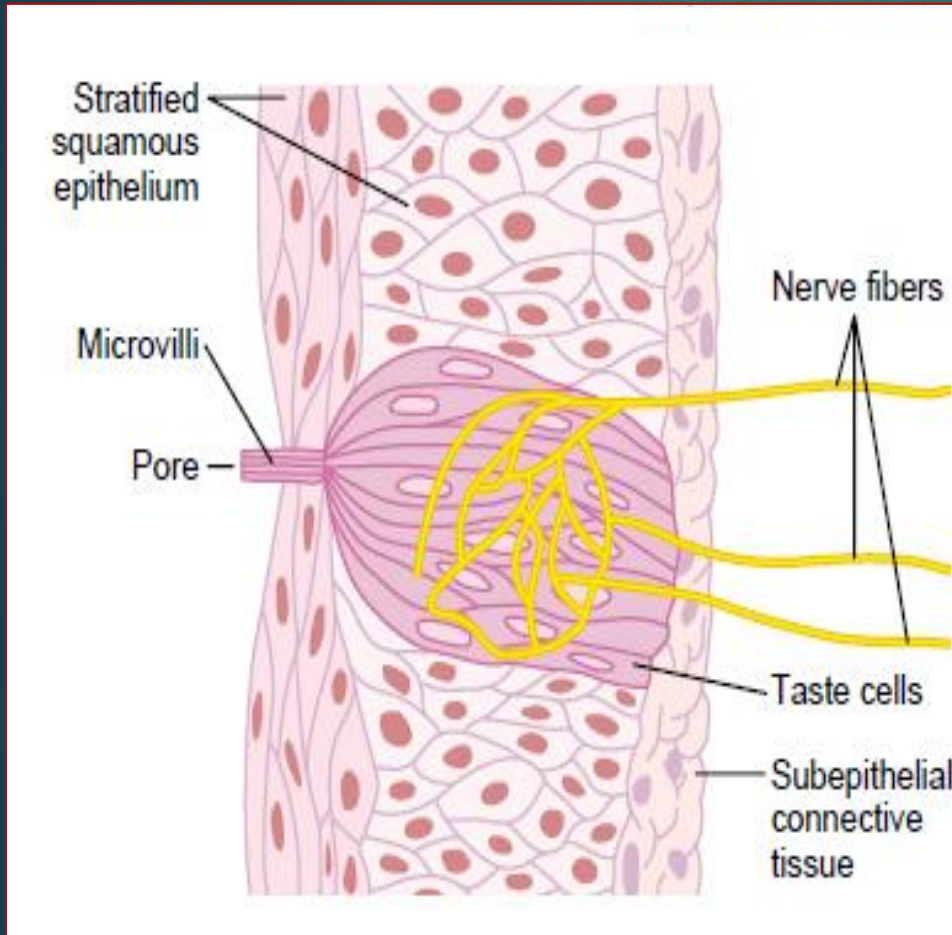
Tongue And Taste Buds

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A Taste Bud

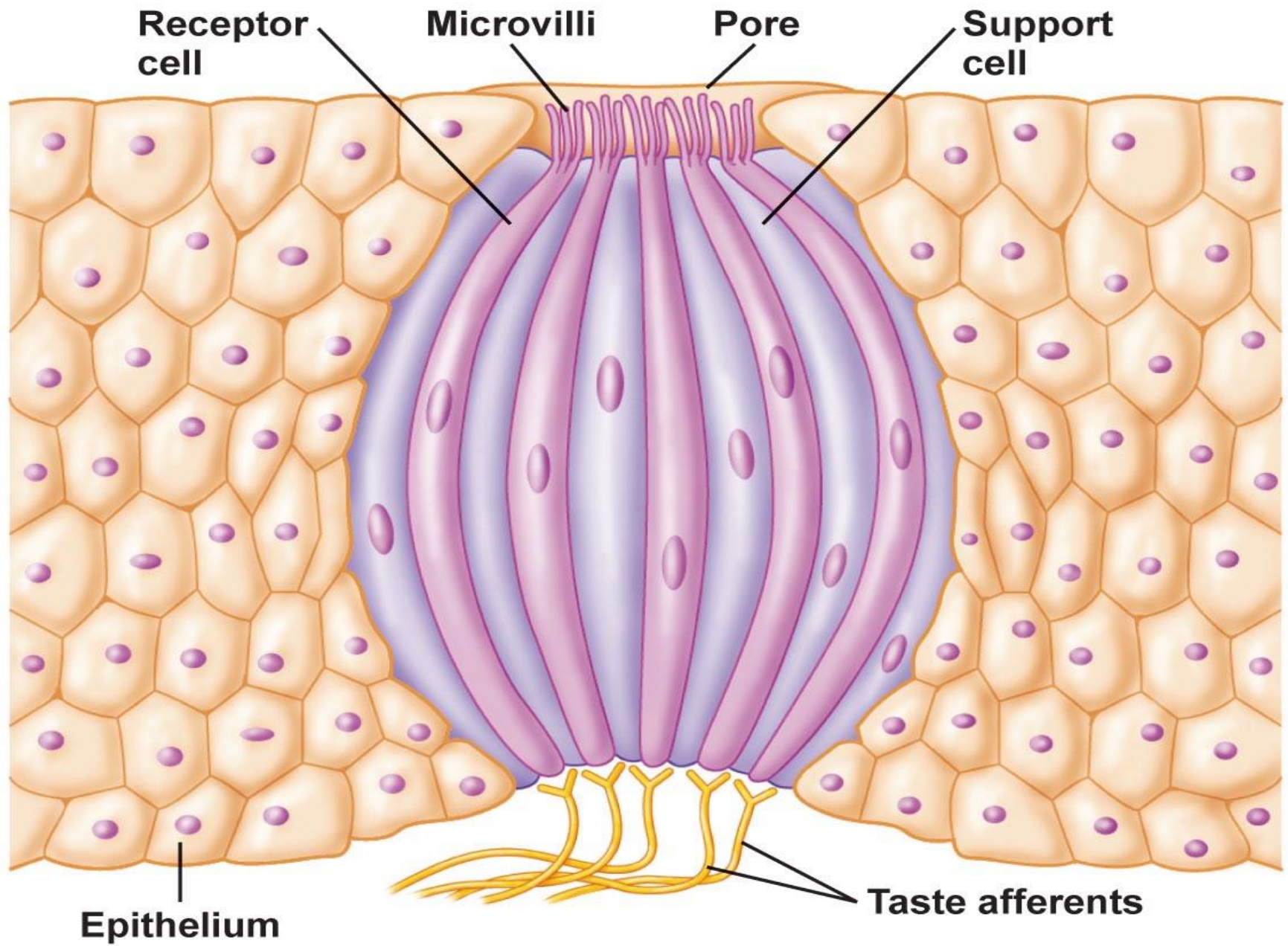
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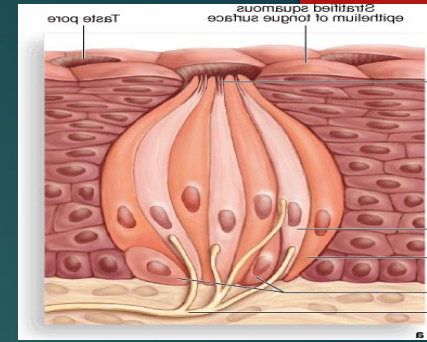
Taste Bud....

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- ▶ **mature cells** that lie toward the **centre** of bud → break up and dissolve
- ▶ life span of each taste cell is about 10 days in lower mammals but is unknown for human
- ▶ outer tips of taste cells are arranged around a minute **taste pore**
- ▶ from tip of each taste cell, several **microvilli**, or taste hairs, protrude outward into taste pore to approach the cavity of the mouth
- ▶ These microvilli provide the receptor surface for taste



Taste bud...



- ▶ Interwoven around the cells are branching terminal network of taste nerve fibers that are stimulated by the taste receptor cells
- ▶ Many vesicles form beneath the cell membrane near the fibers
- ▶ These vesicles contain a neurotransmitter substance that excite the nerve fiber endings in response to taste stimulation

Distribution

Taste buds are located in the following areas:

- ▶ The papillae on the anterior 2/3 of the tongue (**Facial nerve**)
- ▶ The posterior 1/3 of the tongue, including vallate papillae (**Glosopharyngeal nerve**)
- ▶ The soft palate (**Facial nerve**)
- ▶ The pharynx (**Glosopharyngeal nerve**)
- ▶ The epiglottis (**Vagus nerve**)

Taste bud...

- ▶ Adults have **3000 to 10,000** taste buds, and children have a few more
- ▶ Beyond the age of 45 years, many taste buds degenerate, causing the taste sensation to become progressively less critical in old age



Tongue

Flavour
Molecule

Receptor

Primary Sensory
Axon

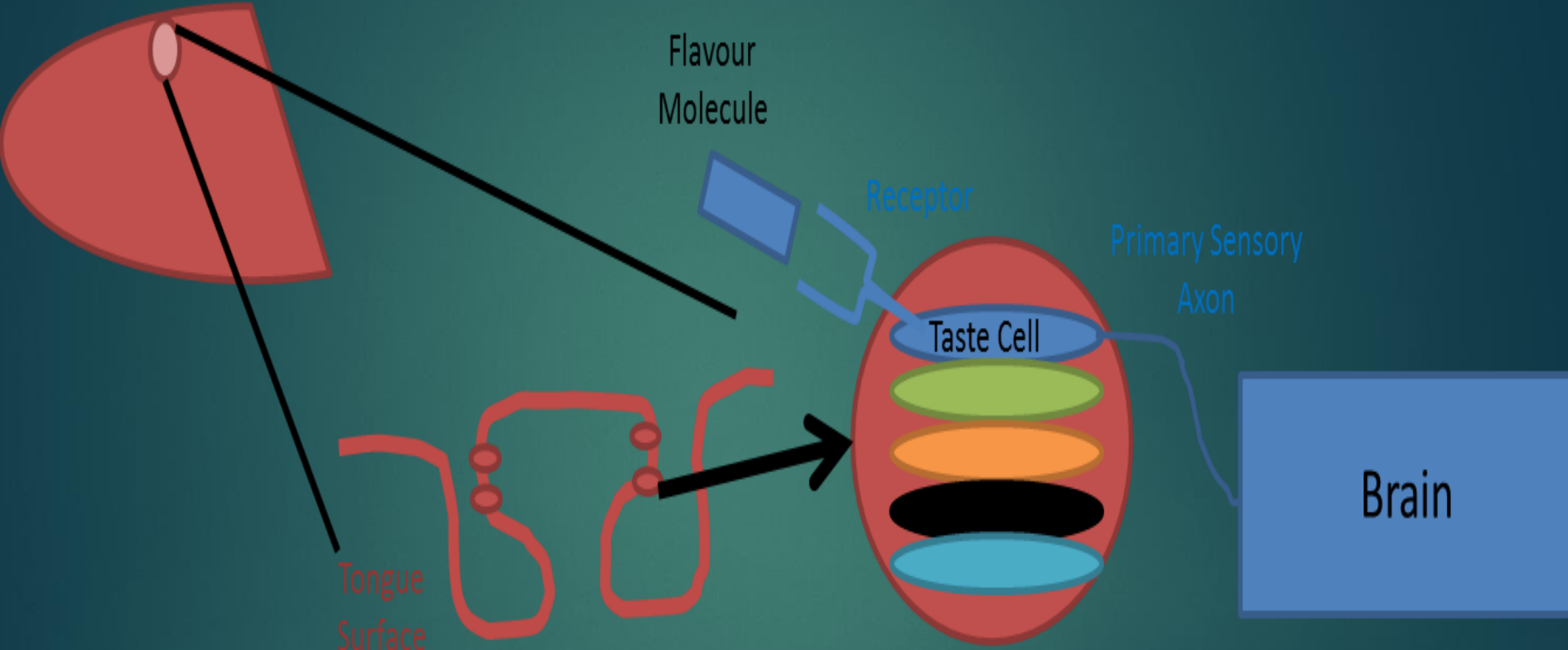
Taste Cell

Brain

Tongue
Surface

Papilla

Taste Bud





**NOTHING
TASTES
AS GOOD AS
HEALTHY
FEELS**

Questions?



