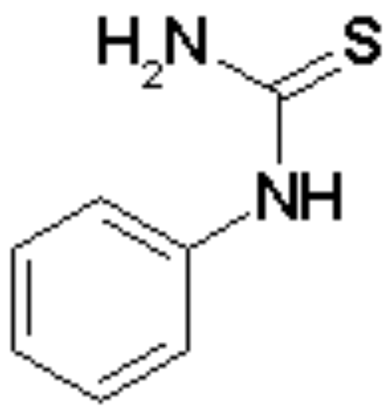
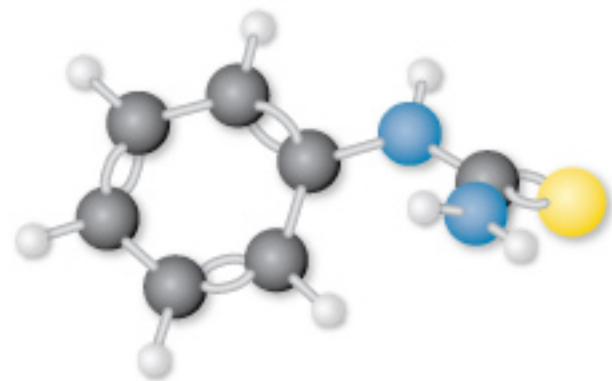
PTC: Phenylthiocarbamide

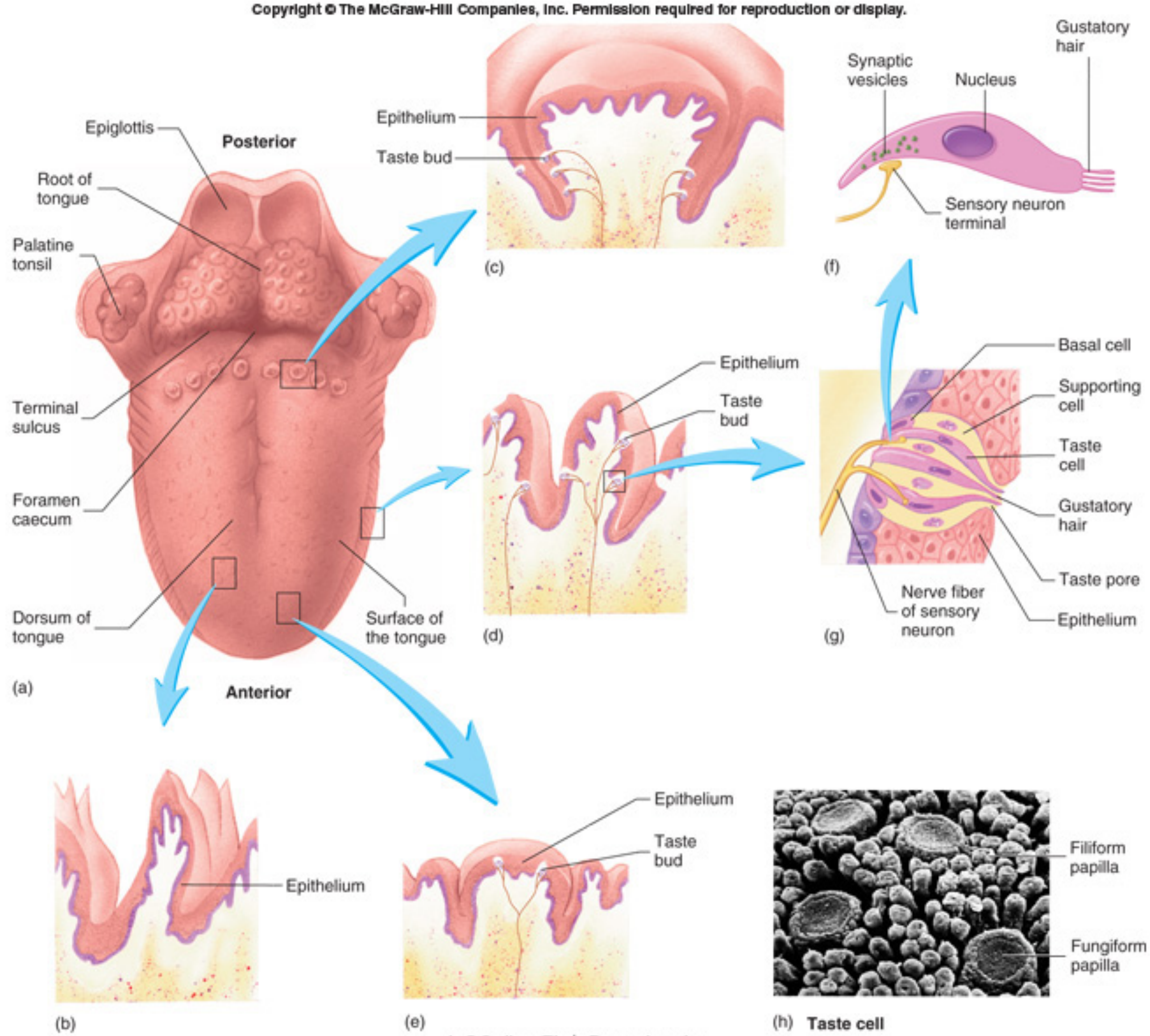




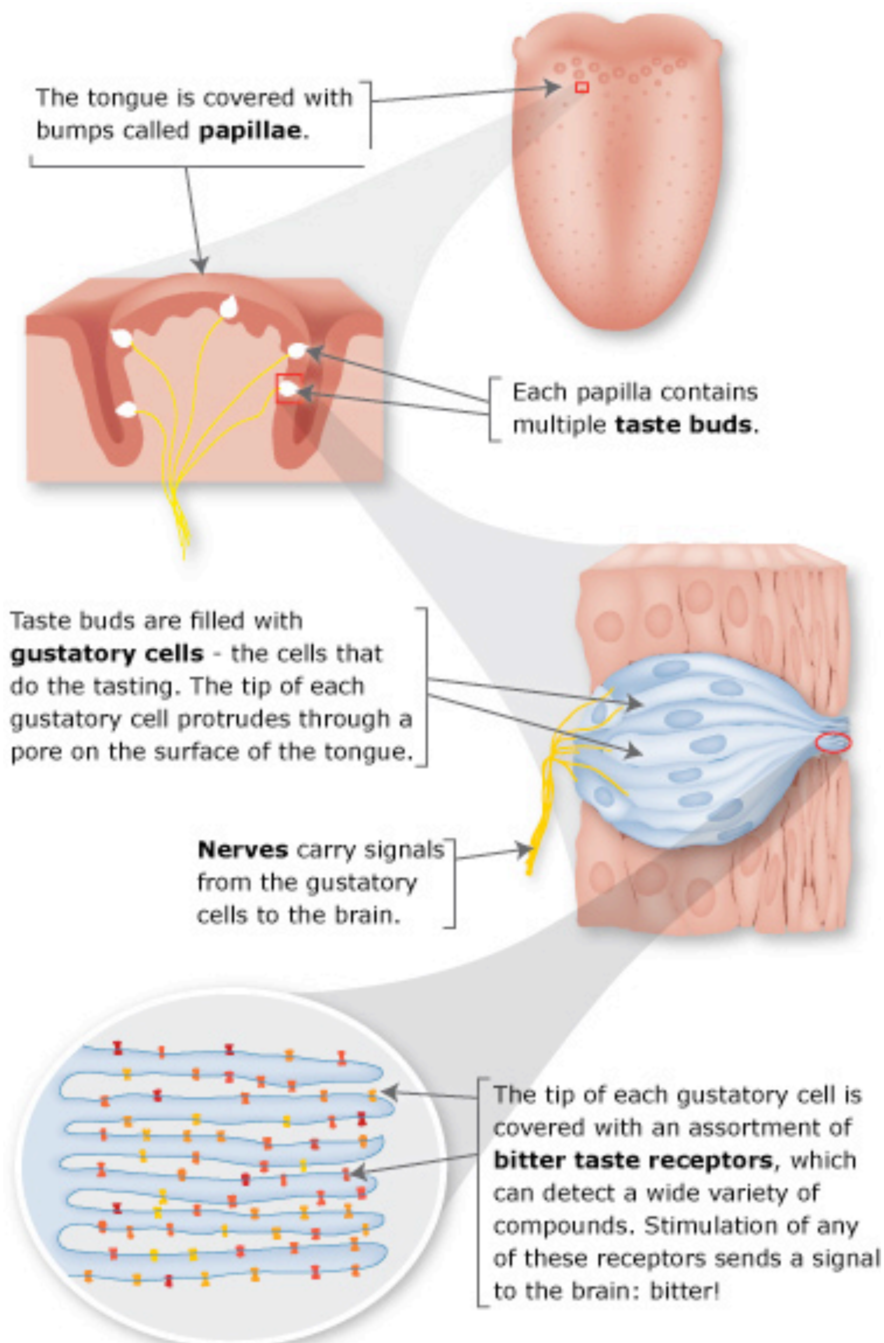
$C_7H_8N_2S$

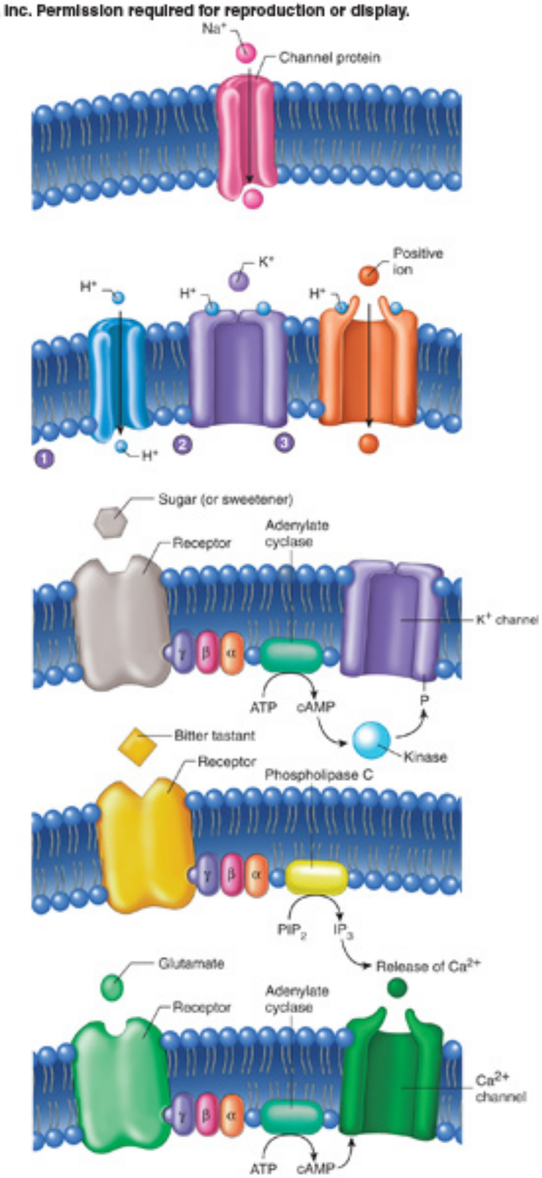
PTC Tasting

- PTC stands for phenylthiocarbamide.
- In 1931 a Dupont chemist, Arthur Fox, accidentally released some PTC powder into the air.
- His colleague complained about the taste, but Fox noticed no taste.
- They both directly tasted the powder.
- The ability to taste PTC (and related compounds) is genetic.
- PTC tasting became one of the earliest genetic tests.
- The taste of PTC is bitter.
- PTC does not occur in nature, but many related compounds do, and any of them creates the sensation of bitterness.



Epiglottis
Posterior
Root of tongue
Palatine tonsil
Terminal sulcus
Foramen caecum
Dorsum of tongue
Surface of the tongue
(a)
Anterior
Epithelium
Taste bud
(c)
Synaptic vesicles
Nucleus
Gustatory hair
Sensory neuron terminal
(f)
Epithelium
Taste bud
(d)
Basal cell
Supporting cell
Taste cell
Gustatory hair
Taste pore
Nerve fiber of sensory neuron
Epithelium
(g)
Epithelium
(b)
Epithelium
Taste bud
(e)
Filiform papilla
Fungiform papilla
(h) Taste cell


The tongue is covered with bumps called **papillae**.
Each papilla contains multiple **taste buds**.
Taste buds are filled with **gustatory cells** - the cells that do the tasting. The tip of each gustatory cell protrudes through a pore on the surface of the tongue.
Nerves carry signals from the gustatory cells to the brain.
The tip of each gustatory cell is covered with an assortment of **bitter taste receptors**, which can detect a wide variety of compounds. Stimulation of any of these receptors sends a signal to the brain: bitter!



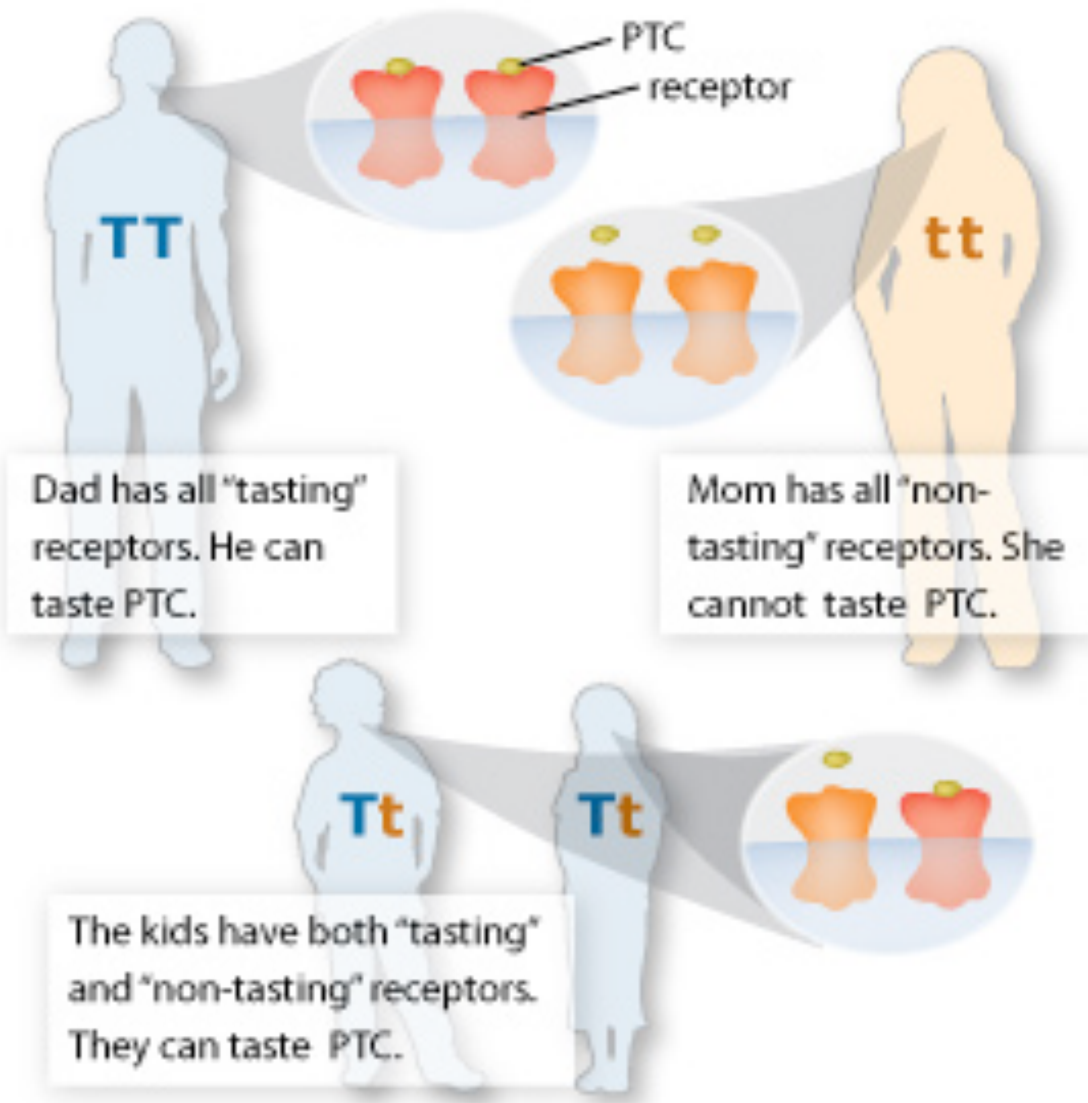
(a) **Salt:** Sodium ions diffuse through Na^+ channels, resulting in depolarization.

(b) **Sour (acid):** Hydrogen ions (H^+) from acids can cause depolarization by one of three mechanisms: (1) They can enter the cell directly through H^+ channels, (2) they can bind to gated K^+ channels, closing the gate, and preventing K^+ from entering the cell, or (3) they can open ligand-gated channels for other positive ions.

(c) **Sweet:** Sugars, such as glucose, or artificial sweeteners bind to receptors and cause the cell to depolarize by means of a G protein mechanism. The α subunit of the G protein activates adenylate cyclase, which produces cAMP. cAMP activates a kinase that phosphorylates K^+ channels. The K^+ channels close, resulting in depolarization.

(d) **Bitter:** Bitter tastants, such as quinine, bind to receptors and cause depolarization of the cell through a G protein mechanism. The α subunit of the G protein activates phospholipase C, which converts phosphoinositol (PIP_2) to inositol triphosphate (IP_3). IP_3 causes Ca^{2+} release from intracellular stores and depolarization of the cell.

(e) **Glutamate (umami):** Amino acids, such as glutamate, bind to receptors and cause depolarization through a G protein mechanism. The α subunit of the G protein activates adenylate cyclase, which catalyzes the conversion of ATP to cAMP. cAMP opens Ca^{2+} channels. The influx of Ca^{2+} causes depolarization of the cell.


PTC
receptor
TT
tt
Dad has all "tasting" receptors. He can taste PTC.
Mom has all "non-tasting" receptors. She cannot taste PTC.
Tt
Tt
The kids have both "tasting" and "non-tasting" receptors. They can taste PTC.