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QUESTION

Elucidate the pathways involved in taste

ANSWER

The tongue contains small bumps called papillae, within or near which taste buds are situated. In the tongue's taste buds, the taste receptors receive sensory input via two important mechanisms – depolarization and neurotransmitter release. Intake of salty foods leads more sodium ions to enter the receptor, causing the said mechanisms. The same is true with intake of sour foods (hydrogen ions) and sweet foods (sugar molecules), both of which result to the closing of K⁺ channels upon their entry.

From the axons of the taste receptors, the sensory information is transferred to the three taste pathways via the branches of cranial nerves VII, IX and X. The chorda tympani of CN VII (facial nerve) carries the taste sensory input from the tongue's anterior two-thirds. Then, the rest of the taste sensations from the throat, palate and posterior tongue are transmitted by the branches of CN IX (glossopharyngeal nerve) and CN X (vagus nerve). From these cranial nerves, taste sensory input travels through the nerve fiber synapses to the solitary tract, the ventral posteromedial thalamic nuclei, and the thalamus. In these three locations, there are clustered neurons which respond to the same taste (sweet, sour, salty or bitter). The thalamus relays the information to the primary gustatory cortex located in the somatosensory cortex. The primary gustatory cortex is where the perception of a particular taste is processed.

The sensation commonly called taste is really a combination of both smell and taste. The appropriate term to use for the combined experience of smell and taste as experienced while eating and drinking is flavor. The term "taste" should be restricted to the perceived outcome of stimulating the receptor cells of taste buds located on the surface of the tongue. This sense of taste, or gustation, is similar to the sense of smell (olfaction) in that stimuli interact chemically with the receptors during the encoding process. Tasted substances must dissolve in saliva before they can interact with the taste receptors. Saliva then holds the dissolved chemicals close to the collections of receptor cells, called taste buds. The performance of taste buds deteriorates rapidly in the absence of saliva. The chemical taste receptors are located buried within the "bumps" (called papillae) that cover the surface of the tongue. In addition to increasing the surface area for taste buds, the papillae create an abrasive surface that helps to hold food within the mouth.

There may be two separate gustatory pathways. The first, lemniscal pathway ascending from the thalamus to gustatory cortex, may be specialized for the identification and discrimination of taste stimuli. Whereas the second ventral forebrain pathway involving projections from the gustatory nuclei of the medulla to the amygdala, hypothalamus, and other limbic structures, may be specialized for the affective and motivational responses made to taste stimuli.