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QUESTION

ELUCIDATE THE PATHWAY INVOLVED IN TASTE

Taste pathway is taught in medical schools for students to learn about the taste sensation and its perception. It is important for students to know about the taste modalities, the receptors involved, the pathway, applied aspects and differential diagnosis. Though taste disorders do not directly affect one's life, it has an impact specifically on the quality of life. Taste disturbances can be present in those with: Bell's palsy, lesions of tegmentum in midbrain and/or pons, thalamic lesion, radiation treatment of head and neck, trauma or lesion to the taste pathway and some uncommon cause such as Sjogren's syndrome. As teachers, we have encountered questions from undergraduate students regarding the varied viewpoints in the taste pathway as given in neuroanatomical and neurophysiology text books. Recent studies about the taste pathway also support these contradicting viewpoints.

The taste buds present on the anterior 2/3rd of the tongue are innervated by the facial nerve, posterior 1/3rd by the glossopharyngeal and epiglottis by vagus. These afferent fibers relay in the nucleus of tractus solitarius (NTS). Fibers from the NTS synapse in the thalamus, which pass to the somatosensory cortex. The various viewpoints put forth by fMRI studies, clinical examinations of the cranial nerves and lesions of the taste pathway shows that, the variation lies between the NTS and thalamus, which are:

(a)The second order neurons from NTS synapse at thalamus and the fibers project to the ipsilateral cerebral cortex;

(b) The second order neurons arising from NTS, cross to opposite side and synapse at the thalamus, which projects to the contralateral cerebral cortex; (c)'Few' fibers from NTS decussate and terminate at the contralateral somatosensory cortex, whereas majority of the fibres continuing on ipsilateral side, project to the ipsilateral cerebral cortex (i.e., a bilateral representation).

In view of the various viewpoints of the taste pathway mentioned above (a, b & c), we wish to emphasize that the students need to be taught about the bilateral representation of the taste

pathway. This would help the students to obtain an integrated approach of the information about the pathway given in anatomy and physiology textbooks. However, the students should also be sensitized about current concepts and research where there is a lack of evidence in regard to the taste pathway.

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.