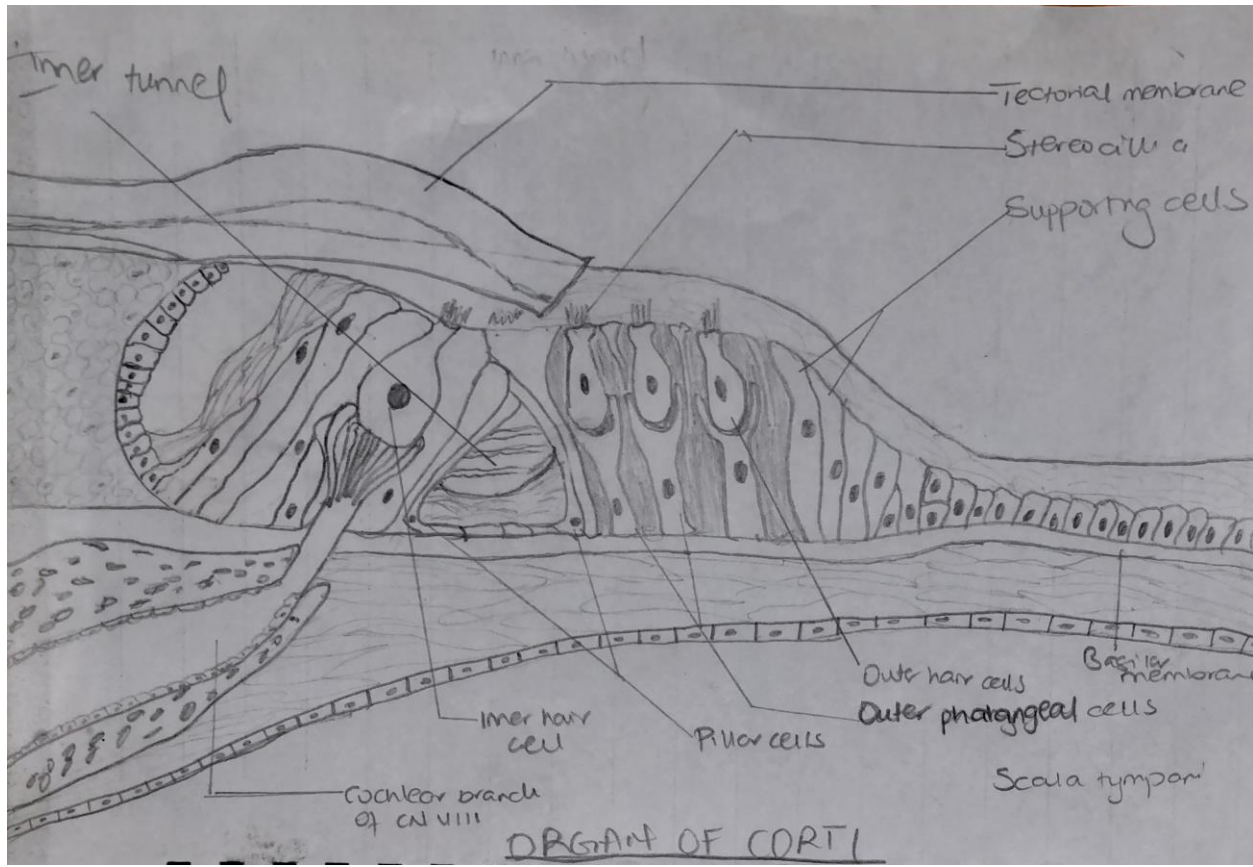


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Medicine and Surgery

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Organ of Corti



The organ of Corti is a specialized sensory epithelium that allows for the transduction of sound vibrations of different frequencies into neural signals. The organ of Corti itself is located on the basilar membrane. The organ of Corti rests on the basilar membrane and contains two types of hair cells. The sensory hair cells have precisely arranged v shaped bundles of rigid stereocilia; each loses its single kinocilium during development. The hair cell types are:

- Inner hair cells transduce sound from vibrations to neural signals via the shearing action of their stereocilia. Each columnar outer ha There are about

12,000 in total and occur in three rows near the saccule, increasing to five rows near the cochlea.

- Outer hair cells serve a function as acoustic pre-amplifiers which improve frequency selectivity by allowing the organ of Corti to become attuned to specific frequencies, like those of speech or music. These cells are shorter and they form a single row of 3,500 cells each with a single more linear array of stereocilia. The fibrous tectorial membrane rests on top of the stereocilia or the outer hair cells. Mutations in an alpha-tectorin, which encodes a protein specific to the tectorial membrane, cause deafness.

- Both outer and inner hair cells have synaptic connections with afferent and efferent nerve endings, with the inner rows of cells more heavily innervated. The cell bodies of the afferent bipolar neurons constitute the spiral ganglion which is located in the bony core of the modiolus.

- Inner and outer phalangeal cells extend apical processes that intimately surround the basolateral parts of both inner and outer hair cells and synaptic nerve endings. The apical ends of these phalangeal cells are joined to the hair cells by tight zonulae occludens, forming an apical plate across the spiral organ through which the stereocilia bundles project into the endolymph.

- Pillar cells are stiffened by heavy bundles of keratin and outline a triangular space, the inner tunnel, between the outer and inner complexes of hair cells and phalangeal cells. The stiff inner tunnel also plays a role in sound transmission.

- The tallest stereocilia are embedded in a gel like tectorial membrane. The tectorial membrane is an acellular layer that extends over the organ of Corti from the connective tissue around the modiolus. It consists of fine bundles of collagen II, V, IX associated with proteoglycans. It forms during the embryonic period from secretions of cells lining this region.

- By detecting minute movements of stereocilia, hair cells in the spiral organ of Corti act as mechano-electrical transducers very much like those of the vestibular maculae and mediate the sense of hearing.