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HISTOLOGY OF THE ORGAN OF CORTI

The organ of Corti is an organ of the inner ear contained within the **SCALA MEDIA**, a cavity contained within the cochlea. The scala media contains a fluid, **endolymph**, high in k^+ concentration. This fluid regulates the electrochemical impulses of the auditory hair cells.

The organ of Corti is a specialized sensory epithelium that allows for the transduction of mechanical sound vibrations into neural signals (action potential). The organ of Corti, itself, rests on the **basilar membrane**. It is overlain by a fibrous, gel-like membrane, **TECTORIAL MEMBRANE**, which is indirectly connected to the osseous **spiral lamina** by the **spiral limbus**. It contains two types of hair cells:

- Inner hair cells
- Outer hair cells; and
- Several Supporting cells (Deiter's cells or phalangeal cells, Hensen and Pillar cells)

1. Inner Hair Cells: They are the primary sense organs for audition. They are flask-shaped. They are arranged in a single row with '**W**' shaped **stereocilia** at their apical ends (POLE). The stereocilia lie underneath the tectorial membrane projecting and swaying in the endolymph. At their basal ends (NEURAL POLE), each hair cell is innervated by **20** afferent fibres from the

cochlear nerve. The hair cells transduce sound from vibrations to neural signals via the shearing action of their stereocilia.

2. **Outer Hair Cells:** They are cylindrical-shaped. They are arranged from three (3) rows and at the **base** to five (5) rows at the **apex** of the basilar membrane. They rest on the supporting cells (called Deiter's cells) that comprise 75–80% of all hair cells. The tips of their stereocilia are embedded in the overlying tectorial membrane. They only receive **5–10%** of the afferent innervation from the cochlear nerve, but synapse with a large number of efferent nerve terminals originating in the olivocochlear bundle. They act 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.

NOTE: Mutations in alpha-tectorin, which encodes a protein specific to the tectorial membrane, cause deafness.

SUPPORTING CELLS

Supporting cells are rich in actin and tubulin (cytoskeletal proteins) to provide mechanical support to the organ of Corti. They are:

- Deiter's cells
 - Hensen cells
 - Pillar cells
1. **DEITER'S CELLS:** Also known as **PHALANGEAL CELLS**. They contain both micro-filaments and micro-tubules which run from the basilar membrane to the reticular membrane of the inner ear. They hold the base of the outer hair cells in a cup-shaped depression. They have two parts:
 - Somatic part
 - Phalangeal process, which links its soma to the reticular lamina.
 2. **PILLAR CELLS:** The most conspicuous supporting cells in the organ of Corti are the inner and outer pillar cells. They form the tunnel of Corti between the inner hair cells and outer hair cells. These cells rest upon the basilar membrane.

3. **HENSEN CELLS:** **Hensen's cells** are a layer of tall columnar cells arranged in the organ of Corti in the cochlea, which are part of the supporting cells lie on the outer hair cells. They form the outer border of organ of Corti. They are important in ion metabolism and homeostasis regulation of both endolymph and perilymph, modulation of the hearing sensitivity, regulation and regeneration of the hair cells, and prevention of the cochlea damage. Hensen's cells and Deiter's cells which surround the sensory cells in the organ of Corti are joined by gap junctions, which function as electrical and metabolic communication from cell to cell through a long distance.



