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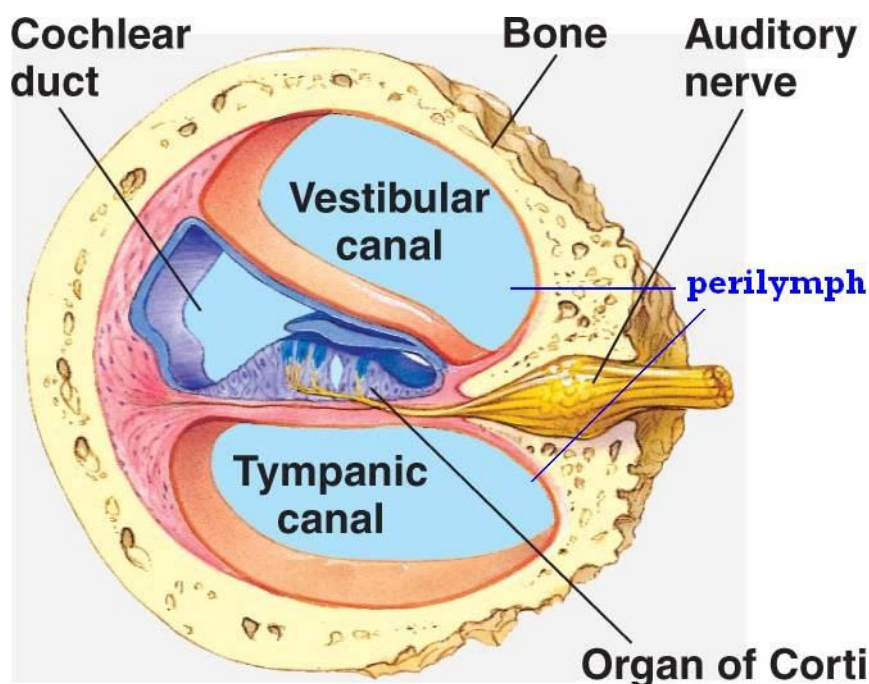
**Matric Number: - 17/MHS01/010**

**ANA 305 Assignment; - Histology of the Ear.**

**Course Title: - Histology of Special Senses and Neurohistology.**

Essay on the Histology of an Organ of Corti, With the Aid of a Diagram.

The Organ of Corti is a part of the cochlea and it mediates the sense of hearing transducing pressure waves to action potentials. This structure is localized in the scala media and it is formed by a series of hair cells, nervous terminations of spiral ganglion and supporting cells.



Organ of Corti consists of different types of hair cells:

- \*Inner hair cells
- \*Outer hair cells

\*Supporting cells

**a) Inner Hair Cell: -**

These cells are specialized in the mechano-electrical transduction. There are almost 3500 cells disposed in one line along all the basilar membrane. They are connected to type I neuron peripheral fibers of spiral ganglion, these connections are very divergent (10/1). The luminal part of the cell is immersed in endolymph, the basal one is immersed in normal extracellular fluid. The luminal portion is formed by bundles of stereo cilia (inner ear), whose tips are connected by filamentous structures called tip-links.

The inner hair cells are in a single row close to the inner pillar cells. Note that the inner hair cells account for ~90-95% of the sensory input into the auditory system.

Loss of inner hair cells in a particular region of the cochlea would result in an almost complete inability to detect specific frequencies regardless of how loud they are.

Loss of spiral ganglion cells would have a similar effect as that of the loss of inner hair cells since these are the cells that actually project into the CNS. In both cases, the deafness could only be corrected with a cochlear implant.

**b) Outer Hair Cell: -**

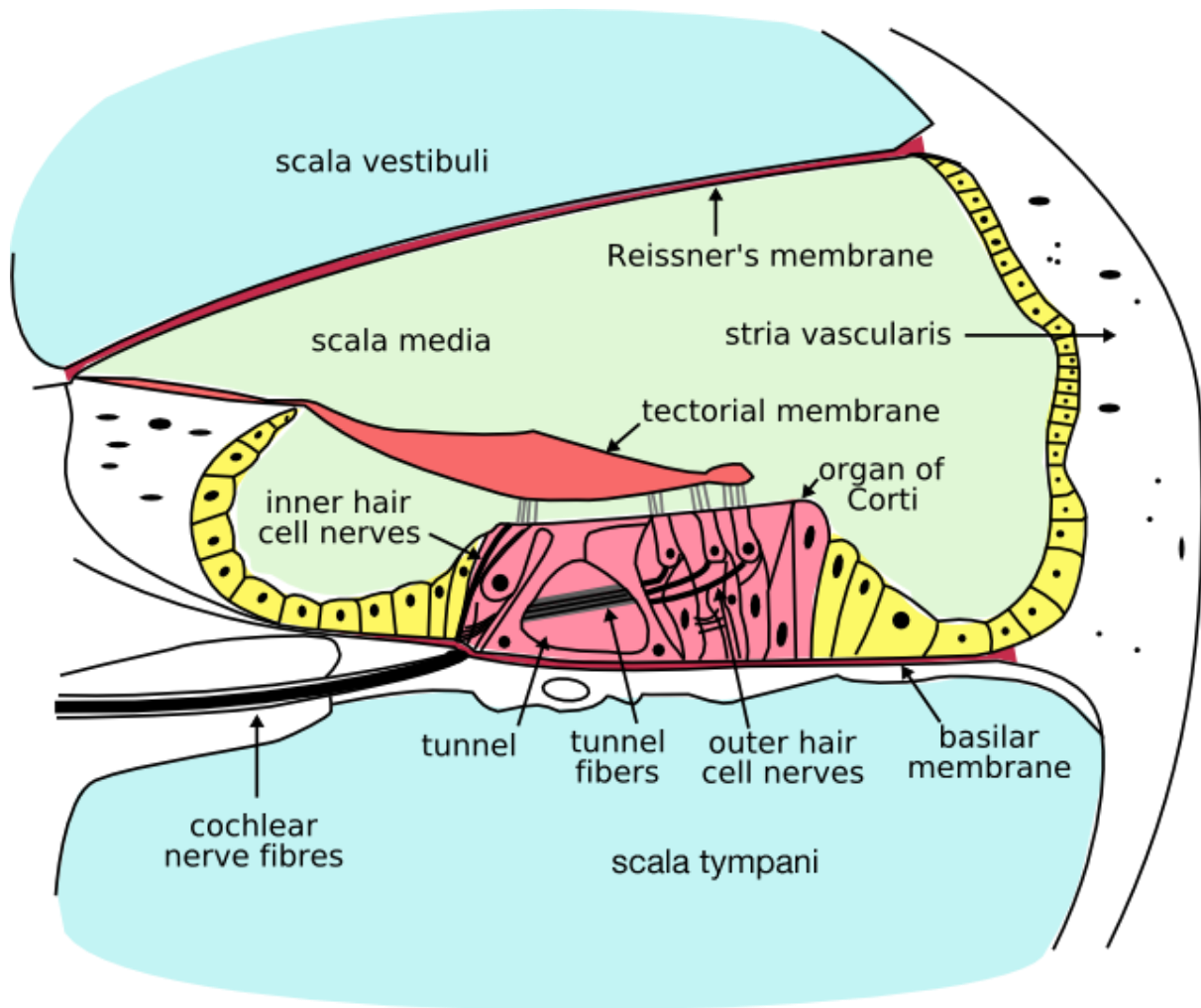
These cells are acoustical pre-amplifiers. They are almost 12000, disposed in three parallel lines. These cells are connected to type II myelinated neurons, the connections are very convergent. They have also an afference from superior olivary nucleus. They have contractile activity.

The outer hair cells are surrounded by outer phalangeal cells. There are three rows of outer hair cells. The apices of these cells and their phalangeal cells are joined together to form the reticular membrane

(also called reticular lamina or apical cuticular plate) that separates endolymph in the scala media from underlying corticolymph and perilymph of the scala tympani. Lateral to the outer hair cells and phalangeal cells are other support cells. Note that outer hair cells account for only approximately 5-10% of the sensory input into the auditory system. The primary function of outer hair cells is actually to contract when stimulated, thus “pulling” on the tectoral membrane thereby stimulating the inner hair cells.

Outer and inner pillar cells outline a triangular shaped tunnel, called the inner tunnel, which is filled with perilymph-like fluid called corticolymph.

Loss of outer hair cells in a particular region of the cochlea would result in a “threshold shift” whereby sound of a particular frequency could still be detected (because the inner hair cells are still intact), but it would have to be louder to make up for the fact that there are no outer hair cells to help stimulate the inner hair cells. This type of hearing loss can be compensated by a hearing aid.



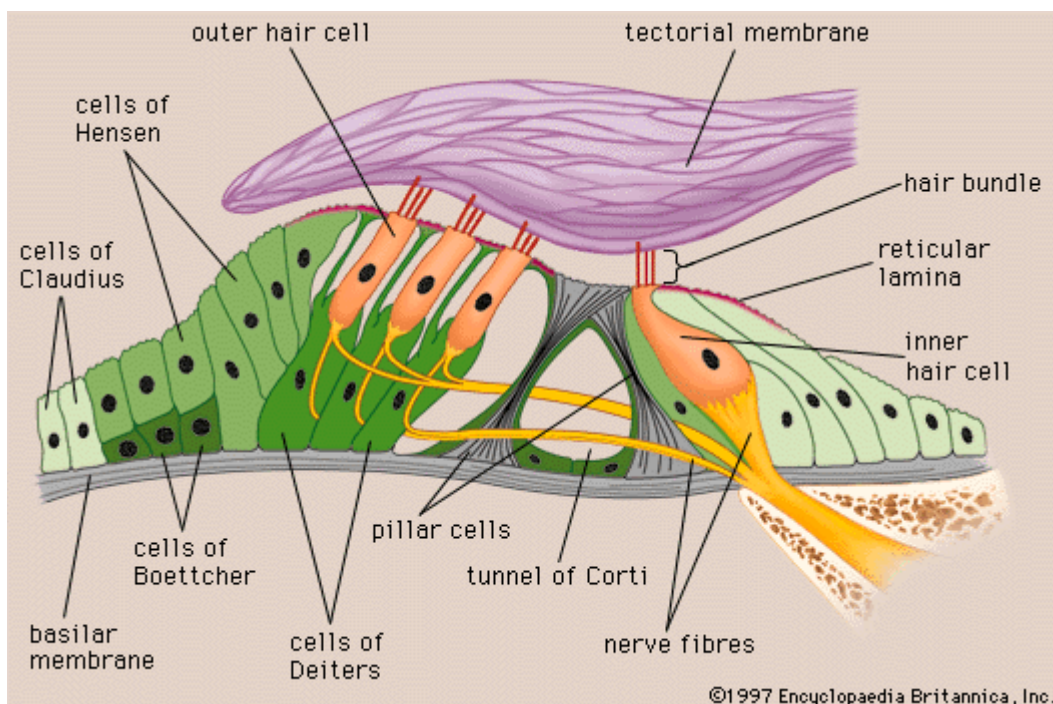
### c) Supporting Cells: -

These cells are of four different types: Corti pillars, Hensen cells, Deiters cells and Claudius cells.

- Corti pillars are cells forming the outer and inner walls of the tunnel in the organ of Corti.
- Hensen cells are one of the supporting columnar cells between the outer hair cells and the cells of Claudius in the organ of Corti.
- Deiters' cells, also known as phalangeal cells or cells of Deiters, are a cell type found within the inner ear. They contain both micro-filaments and micro-tubules which run from the basilar membrane to the reticular membrane of the inner ear. These

cochlear supporting cells include a somatic part, with its cupula, and a phalangeal process, which links the Deiters soma to the reticular lamina. The part of the phalanx which is included in the reticular lamina is the apex of the phalanx (phalangeal apex).

- Hensen's cells are a layer of tall cells arranged in the organ of Corti in the cochlea, which are part of the supporting cells lie on the outer hair cells (OHC). Their appearance are upper part wide with lower part narrow, column like cells. One significant morphologic feature of Hensen's cells is the lipid droplets, which are most noticeable at the third and fourth turns of the cochlear, the lipid droplets are thought to have association with the auditory process because they are parallel to the innervation. One significant structure found among the Hensen's cells and the hair cells are the gap junctions, they are made of connexins which serve important function in distribution and connection between cells, the gaps enable the long distance of electric communication.



The organ of Corti is overlaid by a gelatinous tectorial membrane (produced and maintained by the columnar cells found atop the spiral limbus just medial to the organ of Corti).

Nerve fibers enter the organ of Corti through openings in a shelf of bone extending from the modiolus like the thread of a screw. The nerve fibers pass between supporting cells to synapse with the hair cells.

