

Neurohistology

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Matric number: 17/mhs01/242

Department: Medicine and Surgery

Course: Neurohistology

Question : with the aid of a diagram, write an essay on the histology of the organ of Corti

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 cells:

*Inner hair cells

*Outer hair cells

*Supporting cells

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 stereocilia (inner_ear), whose tips are connected by filamentous structures called tip-links.

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

Supporting Cells

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

Corti pillars : 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.

Hensen's cells : They 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. The shape of Hensen's cells are various in different position of cochlea, they appear as a single layer of cells in the basal coil while appear as cuboidal form in the apical surface. They contain nuclei and microvilli but are limiting of plasma membrane, they are also lack of endoplasmic reticulum and have few mitochondria. In the apical surface, there are free enlarged poles found in the Hensen's cells, the cytoplasm of the cells is a little more dense in the apical surface than the cells in the basal coil. The enlarged poles in the cells which nearly fill the cytoplasm are lipid droplets, which are noticeable at the third and fourth turns of the cochlea, the lipid droplets are thought to have relation with auditory process. The phagosomes found in the cells are another characteristic of the Hensen's cells, indicating that they have a function of phagocytosis. Hensen's cells have rigid cytoskeletons

which are responsible to maintain the structure of the organ of Corti during sound exposure.

Deiters' cells : 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).

Claudius cells : They are considered as supporting cells within the organ of Corti in the cochlea. These cells extend from Hensen's cells to the spiral prominence epithelium, forming the outer sulcus. They are in direct contact with the endolymph of the cochlear duct. These cells are sealed via tight junctions that prevent flow of endolymph between them. Boettcher cells are located immediately under Claudius cells in the lower turn of the cochlea.

Claudius cells are named after German anatomist, Friedrich Matthias Claudius (1822–1869).

Schematic Representation of The Organ of Corti.

