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COLLEGE: MEDICINE AND HEALTH SCIENCES

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COURSE: HISTOLOGY OF SPECIAL SENSES

COURSE CODE: ANA 305

ASSIGNMENT TITLE: HISTOLOGY OF EAR

LEVEL: 300

QUESTION

With the aid of a diagram, write an essay on the histology of an organ of Corti.

ANSWERS

HISTOLOGY OF ORGAN OF CORTI

The organ of Corti is a specialized sensory epithelium that allows for the transduction of sound vibrations into neural signals. It is a part of the cochlea. It is between the scala vestibuli and scala tympani; contained within the scala media. Endolymph fills the scala media. The organ of Corti rests on the basilar membrane.

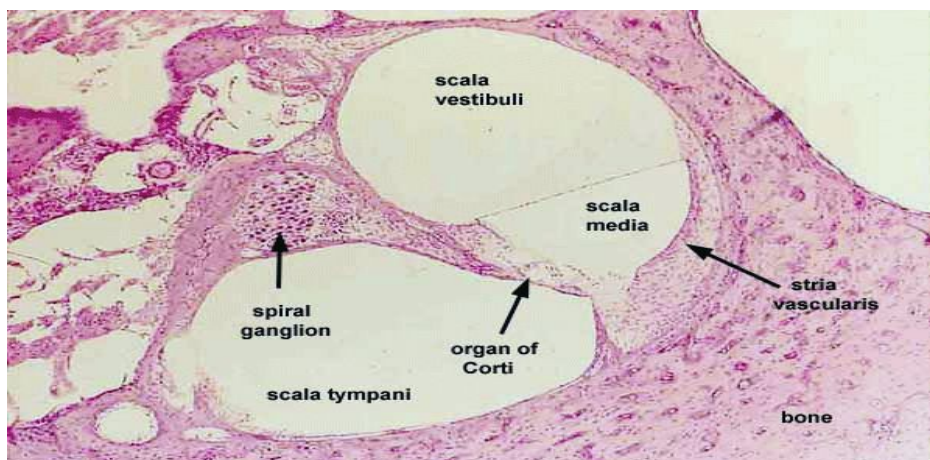


Fig 1. Diagram showing location of the Organ of Corti

The organ of Corti comprises specialized hair cells. The basilar membrane supports the basal ends of the hair cells in the organ of Corti. The apical end of the hair cells touch the tectorial

membrane, a shelf of jelly that is supported immovably on the spiral lamina. The different types of hair cells are:

- Inner hair cells: Inner hair cells transduce sound from vibrations to neural signals via the shearing action of their stereocilia. 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 cells: 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. 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. They are almost 12000, disposed in three parallel lines. These cells are connected to type II amyelinic 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 different types: Corti pillars, Hensen cells, Deiters cells and Claudius cells.
 1. Inner and Outer Pillar Cells: They are tall cells with wide bases and apical ends. It is shaped like an elongated “I”. It is attached to the basilar membrane, and each one arise from a broad base. They support the hair cells of the organ of Corti. The medial wall of the inner tunnel is formed by the inner pillar cells; and the lateral wall is formed by the outer pillar cells. The inner pillar cells are more than the outer pillar cells.
 2. Outer Phalangeal Cells: They are tall columnar cells attached to the basilar membrane. It has a cup-shaped apex. It supports the basilar portions of the outer hair cells along with the bundles of efferent and afferent nerve fibres. They are found below the hair cells.
 3. Inner Phalangeal Cells: It is located deep to the inner pillar cells. They completely surround the inner hair cells they support.

4. Border Cells: They delineate the inner border of the organ of Corti. They are slender cells that support the inner aspects of the organ of Corti.
5. Cells of Hensen: They define the outer border of the organ of Corti. They are tall cells. They are between the outer phalangeal cells and shorter cells of claudius, which rest on the underlying cells of Bottcher.

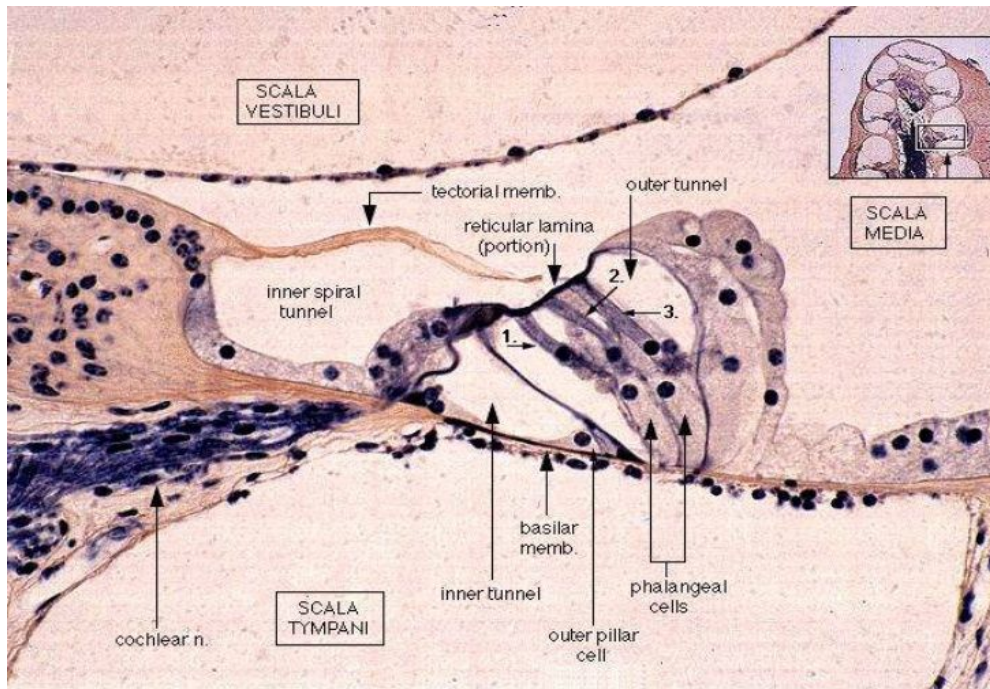


Fig 2. Diagram Showing the Organ of Corti and its components

CLINICAL CORRELATE

1. A cochlear implant is inserted into the scala tympani, where it lies close to the organ of Corti and can artificially stimulate axons of the auditory nerve.
2. Degeneration of hair cells in the organ of Corti is a common cause of hearing loss in older individuals. Recent research has shown the ability of hair cells to regenerate in certain experimental systems and this is now an important area of research in sensory neuroscience.