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**18/MHS01/385**

**Medicine & Surgery**

**Histology Assignment.**

**Question.**

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

The Spiral Organ of Corti

This sensory organ of the hearing is situated on the basilar membrane. It is spread like a ribbon along the entire length of basilar membrane

The spiral organ of Corti is so called because (like other structures in the cochlea) it extends in a spiral manner through the turns of the cochlea. It is made up of epithelial cells that are arranged in a complicated manner. The cells are divisible into the true receptor cells or hair cells, and supporting elements which are given different names depending on their location. The cells of the spiral organ are covered from above by a gelatinous mass called the membrana tectoria. It consists of delicate fibres embedded in a gelatinous matrix. This material is probably secreted by cells lining the vestibular lip of the limbus lamina spiralis. a tunnel can be seen called the tunnel of Corti, which is situated between the inner and outer rod cells and contains a fluid called cortilymph. The base of the tunnel lies over the basilar membrane. To the internal side of the inner rod cells there is a single row of inner hair cells. The inner hair cell is supported by tall cells lining the tympanic lip of the internal spiral sulcus. On the outer side of each external rod cell there are three or four outer hair cells. The outer hair cells do not lie directly on the basilar membrane, but are supported by the phalangeal cells (of Dieters) which rest on the basilar membrane. To the outer side of the outer hair cells and the phalangeal cells, there are tall supporting cells (cells of Hensen). Still more externally the outer spiral sulcus is lined by cubical cells (cells of Claudius). A narrow space the cuniculum externum intervenes between the outermost hair cells and the cells of Hensen. A third space, the cuniculum medium (or space of Nuel) lies between the outer rod cell and the outer hair cells. The spaces are filled with perilymph (or cortilymph).

*Rod Cells*

Each rod cell (or pillar cell) has a broad base (or footplate, or crus) that rests on the basilar membrane; an elongated middle part (rod or scapus); and an expanded upper end called the head. The bases of the rod cells are greatly expanded and contain their nuclei. The bases of the inner and outer rod cells meet each other forming the base of the tunnel of Corti. The heads of these cells also meet at the apex of the tunnel. Here, a convex prominence on the head of the outer rod cell fits into a concavity on the head of the inner rod cell. The uppermost parts of the heads are expanded into horizontal plates called the phalangeal processes. These processes join similar processes of neighboring cells to form a continuous membrane called reticular lamina.

*The Hair Cells*

These important receptor cells of hearing transduce sound energy into electrical energy. The hair cells are so called because their free ‘upper’ or apical ends bear a number of ‘hair’. The hair are really stereocilia. Each cell is columnar or piriform. The hair cells are distinctly shorter than the rod cells. Their apices are at the level of the reticular lamina. Their lower ends (or bases) do not reach the basilar membrane. They rest on phalangeal cells. The plasma membrane at the base of each hair cell forms numerous synaptic contacts with the terminations of the peripheral processes of neurons in the spiral ganglion. Some efferent terminals are also present. The apical surface of each hair cell is thickened to form a cuticular plate the edges of which are attached to neighboring cells.

There are two types of hair cells—inner and outer.

*Inner hair cells*: Inner hair cells form a single row and are richly supplied by afferent cochlear fibers. These are flask-shaped cells and relatively short. They are very important in the transmission of auditory impulses. Their nerve fibers are mainly afferent.

*Outer hair cells*: Outer hair cells are arranged in three or four rows and mainly receive efferent innervation from the olivary complex. These are long cylindrical cells which modulate the function of inner hair cells. Their nerve fibers are mainly efferent.

The lower end of each outer hair cell fits into a depression on the upper end of a phalangeal cell, but the inner hair cells do not have such a relationship. The ‘hair’ of the outer hair cells are somewhat longer and more slender than those on inner hair cells.

Differences between inner hair cells and outer hair cells.

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| --- | --- | --- |
|  | Inner hair cells | Outer hair cells |
| Cell numbers | 3500 | 1200 |
| Rows | One | Three or four |
| Shape | Flask | Cylindrical |
| Nerve supply | Mainly afferent fibers | Mainly efferent fibers |
| Development | Early | Late |
| Function | Transmit auditory stimuli | Modulate function of inner hair cells |
| Ototoxicity & High intensity | More resistant | More sensitive and easily damaged |
| Generation of otoacoustic emissions | No | Yes |
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