

ADEBAYO BLESSING OMOLOLA

17/MHS01/013

300 LEVEL

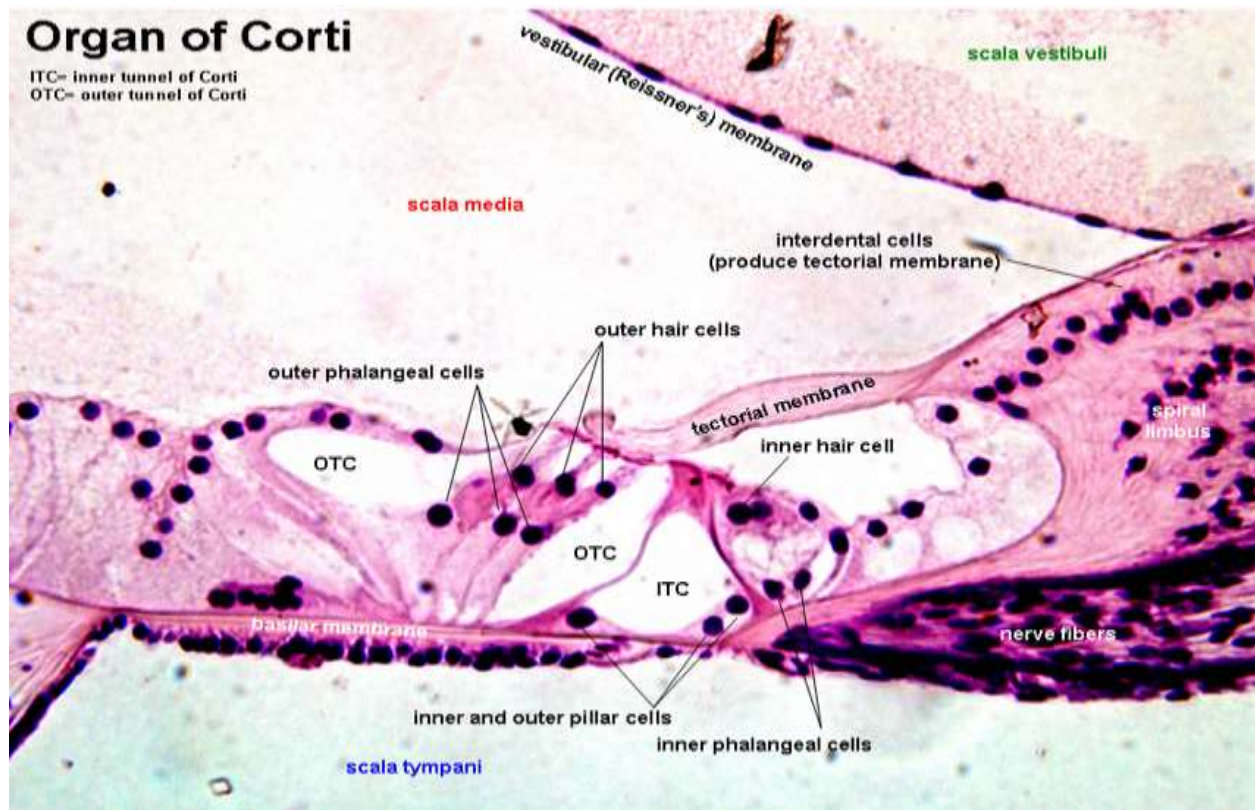
MEDICINE AND SURGERY

NEUROHISTOLOGY

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

ANSWER

THE ORGAN OF CORTI is an organ of the inner ear located within the cochlea which contributes to audition. It is a specialized sensory epithelium that allows for the transduction of sound vibrations into neural signals.



It rests on a basilar membrane (a stiff membrane separating the scala tympani and scala media) and is composed of both supporting cells and mechanosensory hair cells. The arrangement of mechanosensory cells are into inner and outer hair cells along rows. There is a single row of inner hair cells and three rows of outer hair cells which are separated by the supporting cells. Vibrations caused by sound waves bend the stereocilia on these hair cells via an electromechanical force. The supporting cells are also named Deiters or phalangeal cells.

Inner hair cells (Pear shaped). The inner hair cells are supported and enclosed by the inner phalangeal cells, which rest on the thin outer portion, called the tympanic lip, of the spiral limbus. On the inner side of the inner hair cells and the cells that support them is a curved furrow called the inner sulcus. This is lined with more or less undifferentiated cuboidal cells.

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

Outer hair cells (Cylindrical outer hair). Each outer hair cell is supported by a phalangeal cell of Deiters, or supporting cell, which holds the base of the hair cell in a cup-shaped depression. From each Deiters' cell a projection extends upward to the stiff membrane, the reticular lamina, that covers the organ of Corti. The top of the hair cell is firmly held by the lamina, but the body is suspended in fluid that fills the space of Nuel and the tunnel of Corti. Beyond the hair cells and the Deiters' cells are three other types of epithelial cells, usually called the cells of Hensen, Claudius, and Boettcher.

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 of the outer hair cells.

Each hair cell has a cytoskeleton composed of filaments of the protein actin, which imparts stiffness to structures in which it is found. The hair cell is capped by a dense cuticular plate, composed of actin filaments, which bears a tuft of stiffly erect stereocilia, also containing actin, of graded lengths arranged in a staircase pattern. This so-called hair bundle has rootlets anchored firmly in the cuticular plate. On the top of the inner hair cells 40 to 60 stereocilia are arranged in two or more irregularly parallel rows. On the outer hair cells approximately 100 stereocilia form a W pattern.

The stereocilia are about 3 to 5 μm in length. The longest make contact with but do not penetrate the tectorial membrane. This membrane is an acellular gelatinous structure that covers the top of the spiral limbus as a thin fibrillar layer, then becomes thicker as it extends outward over the inner sulcus and the reticular lamina. Its fibrils extend radially and somewhat obliquely to end at its lateral border, just above the junction of the reticular lamina and the cells of Hensen. In the upper turns of the cochlea, the margin of the membrane ends in fingerlike projections that make contact with the stereocilia of the outermost hair cells.