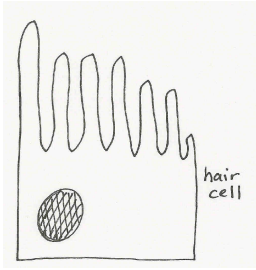


Sensory Physiology



Hearing and Equilibrium

Sensor = modified epithelial cells (also known as hair cells) (FOX fig 10.13)

- Cilia surrounded (imbedded in) gelatinous like material
- Movement or sound waves cause “jello” to move and the cilia to bend
- Mechanically gated channels open
- Depolarization of the hair cell leads to release of neurotransmitters and activation of sensory neuron.

Ear Anatomy

Outer Ear: Captures sound waves (air filled) FOX Figure 10.17

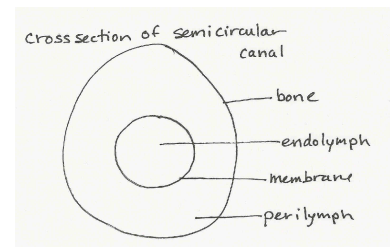
Middle Ear:

- three bones called **ossicles** function to amplify and transduce the signal (FOX 10.18)
- filled with air
- connected to the larynx and throat by eustachian tube (auditory tube)

Inner Ear: consists of vestibular apparatus and cochlea (FOX figure 10.12)

cavity within solid bone

cavity contains **perilymph** (fluid) bathing a **membranous sac** filled with **endolymph** (fluid) (figure at right)



Equilibrium

Vestibular apparatus

3 semicircular structures (FOX figure 10.15)

- sense **angular movement**
- positioned in three directions
- endolymph moves, cupula moves, hair cells bend and gates open.

Utricule and saccule (FOX figure 10.14)

- detect **linear acceleration**
- detect **position of head relative to gravity**
- **otoliths** (little calcium carbonate “stones”) are imbedded in gelatinous material
- otoliths move, “jello” moves, hair cells bend and gates open.

Hearing

The detection of sound occurs in hair cells located in organ of Corti in the **cochlea** (snail shaped structure about the size of a pea) (structure images FOX figures 10.19, 10.22)

Sound waves captured by outer ear, bounce against tympanic membrane (eardrum) and cause the ossicles to vibrate. The ossicles are connected to the cochlea at the **oval window**. When the oval window vibrates it creates movement of the perilymph within the cochlea (this causes the perilymph to push out the **round window**.) The perilymph waves cause the membrane between the perilymph and the endolymph to move, which starts the endolymph moving. This in turn causes movement of the tectorial membrane that the cilia of the hair cells are imbedded in. So once again, the “jello” moves, the hair cells bend, a gate opens, depolarization occurs and neurotransmitters are released exciting the nearby sensory neuron.