

Ear Anatomy and Physiology

Auditory Pathways

The peripheral auditory pathway consists of the outer, middle and inner ear as well as the 8th cranial nerve. The 8th cranial nerve, called the vestibulocochlear nerve, is responsible for maintaining body balance and hearing. The central auditory pathway consists of the brainstem and brain.

Sections

There are three basic sections of the ear in figure 1. the outer ear that includes the pinna and the external auditory meatus. The middle ear that consists of the tympanic membrane, ossicles, and eustachian tube. The inner ear consists of cochlea, vestibule, and semicircular canals



Figure 1 ("Anatomy of the Ear")

Outer Ear

The pinna (AKA the auricle) is made up of cartilage, collects sound, and helps localize sound. Let's see an example of the pinna in figure 2. It has helix, scapha, antihelical fold, antihelix, antitragus, lobule, tragus, entrance to external auditory meatus, concha, and fossa.

The external auditory meatus (or ear canal) connects the outer ear to the middle ear and funnels the sound to the eardrum. This can be seen in figure 3

labeled by the red arrow.

The function of the outer ear is to collect sound.



Figure 2 ("Ear")

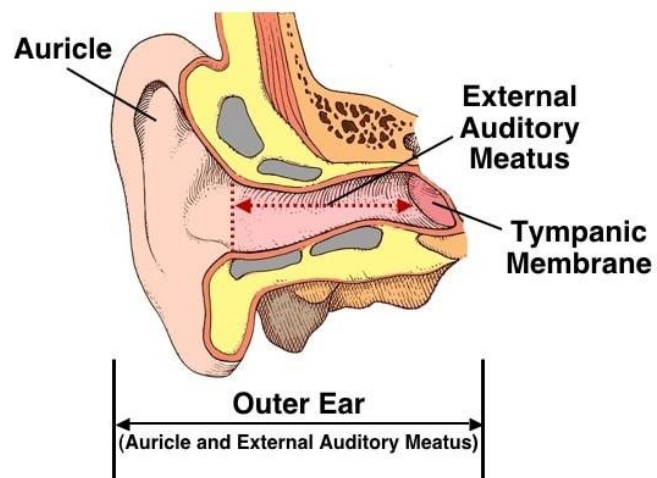


Figure 3 (Stabb, Wayne)

Middle Ear

The tympanic membrane (or eardrum) is the barrier between the outer and middle ear. When sound travels from pinna to the external auditory meatus the sound waves make the tympanic membrane vibrate, which then moves the ossicles. The ossicles are the 3 bones of the middle ear and they are: malleus, incus, and stapes. These provide a way for energy to travel from the tympanic membrane to the inner ear. the eardrum and the ossicles in figure4.

The eustachian tube is connected to the middle ear cavity and helps maintain equilibrium between atmospheric pressure and middle ear pressure. The eustachian tube is labeled as the auditory tube in figure 4.

The function of the middle ear is impedance matching. This means the middle ear increases pressure arriving at the cochlea in order to overcome the resistance to the flow of sound energy.

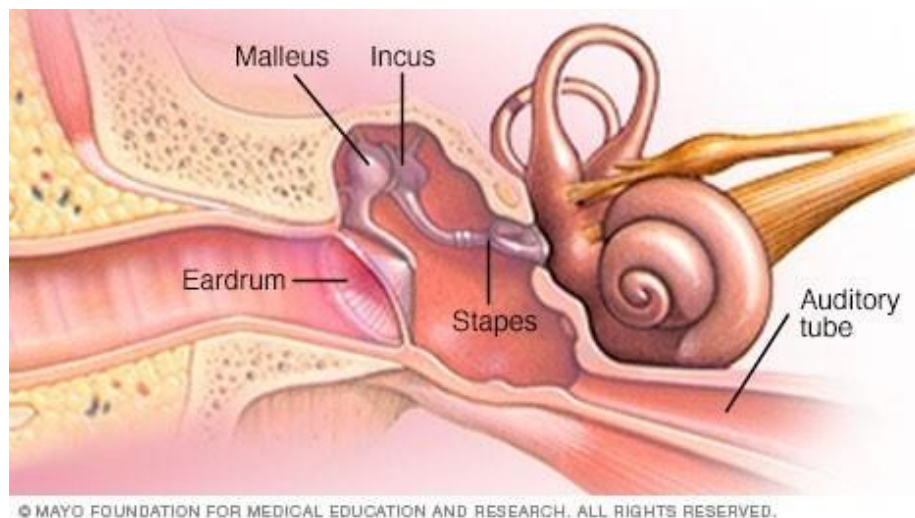


Figure 4 ("Slide Show")

Inner Ear

The cochlea is a snail shell-like shape that holds three fluid-filled chambers. The scala vestibuli (which contains perilymph fluid), the scala media (which contains endolymph fluid), and the scala tympani (which contains perilymph fluid). The cochlea can be seen in figure 5 and the inside of the cochlea in figure 6.

The vestibule is an egg shaped cavity that holds the round window (which helps the middle ear communicate with the scala tympani) and the oval window (which helps the middle ear communicate with the scala vestibuli).

The semicircular canals are fluid-filled tubes that sense your head's orientation which helps to keep balance and coordination.

The function of the inner ear is to change the signal to neural impulses to be interpreted by the brain.

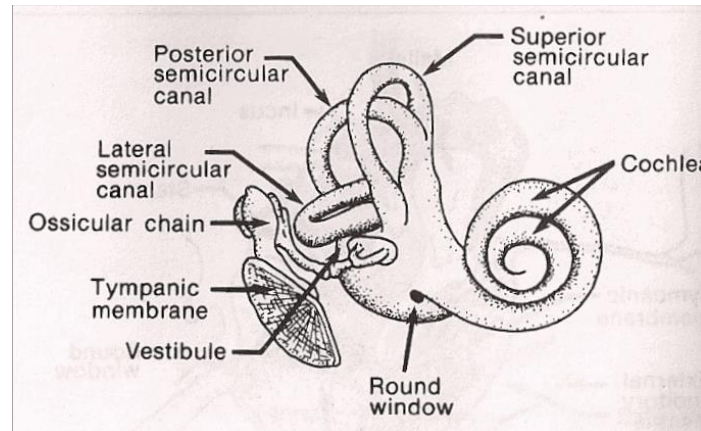


Figure 5 ("The Inner Ear")

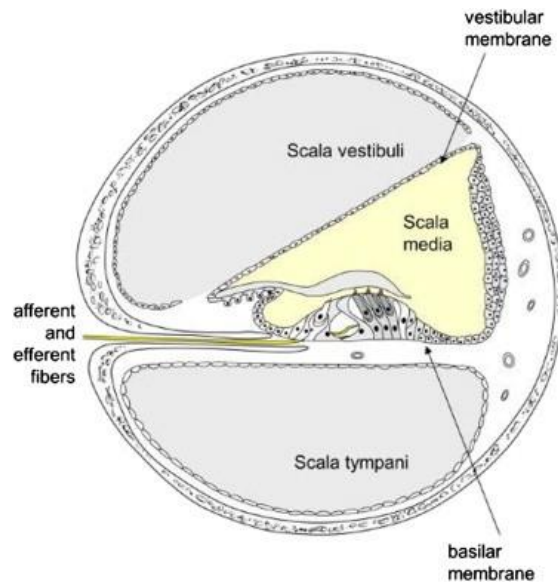


Figure 6 ("Spiral Lamina")

Hearing Process

1. Outer ear collects sound
2. Middle ear matches the acoustic signal with fluid within cochlea
3. Inner ear performs analysis on signal
4. Auditory pathway transports and further processes signal
5. Cerebral Cortex interprets signal

