Bio& 241 A&P
Unit 4 Lab 5
Ear

G Blevins/G Brady/R Bohlen
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External Anatomy of the Human Ear:

Auricle or Pinna	Helix	Antihelix
Lobule	Tragus	Antitragus
Concha	Triangular fossa	External Acoustic Meatus
Tympanic membrane		

Anatomy of the Middle ear or Tympanic Cavity:

Auditory ossicles (Malleus, Incus, Stapes)
Muscles of the Tympanic cavity (Tensor tympani, Stapedius)
Eustachian tube

Anatomy of the Inner Ear, Auditory apparatus, Cochlea

Bony labyrinth

Oval window	Scala vestibule	Perilymph
Round window	Scala tympani	

Membranous labyrinth

Cochlear duct	Endolymph	Vestibular membrane

Organ of corti

Basilar membrane	Tectorial membrane	Outer hair cells
Inner hair cells		

Anatomy of the Inner Ear, Equilibrium apparatus:

Bony labyrinth	Perilymph
Membranous labyrinth	Endolymph

Dynamic equilibrium:

Semicircular canals (Anterior, Posterior, and Lateral)

Ampulla	Crista (Crista ampullaris)	cupula
Hair cells		

Static equilibrium:

Macula and Utricle, Macula

Otoliths	Otolithic membrane	hair cells

Surface anatomy of the tongue

Tip or apex	Margin	Dorsum
Filiform papillae	Fungiform papillae	Foliate papillae
Vallate papillae (circumvallate)		

Histology of the Cochlea:

1. Review **Slide (38)**: Make sure you can identify the following structures:

Bony labyrinth

Scala vestibule	Perilymph	Round window
Scala tympani		

Membranous labyrinth

Cochlear duct	Endolymph	Vestibular membrane

Organ of corti

Basilar membrane	Tectorial membrane	Outer hair cells
Inner hair cells		

Physiological Aspects of Hearing:

Properties of Sound:

Pitch: Subjective perception of different sound *frequencies*

Frequency: Cycles (number of waves) per second, measured in Hertz (Hz). The frequency range in which most people hear is between 20 Hz and 20,000 Hz. The Most sensitive range is between 1,000 Hz and 4,OOO Hz. The normal speech range is 125 Hz to 8,000 Hz.

Loudness: Subjective evaluation of the *amplitude*, usually measured in decibels (dB)

Amplitude: The height, amount of energy, of sound waves.

Conduction impairment (deafness): refers to a blockage of sound waves as they are conducted through the external and middle ear to the sensory apparatus in the Cochlea. The structures of the external and middle ear form a *conduction pathway* which includes the Tympanic Membrane, Malleus, Incus, Stapes, and Oval window. If any of these structures do not vibrate normally, sound waves would not be amplified and the membrane covering the oval window would not vibrate sufficiently, result in impaired hearing.

Nerve impairment (deafness): Is caused by the damage to the nerve pathway between the internal cochlea on up to the acoustic areas of the brain located in the auditory cortex of the temporal lobe. Nerve deafness can be inherited or acquired through nerve damage. The most common cause is damage to the *hair cells* of the *organ of corti.*

Hearing tests:

The Rinne test: This test enables you to differentiate between nerve deafness and conduction deafness.

1. Have the subject plug one ear with a cotton ball. The experimenter should strike the tuning against the palm of their hand to start the tuning fork vibrating. Immediately hold the tuning fork about 10 cm (1 inch = 2.5 cm) From the subjects unplugged ear. The instant the subject can no longer hear the vibrations the experimenter should place the base (handle) of the tuning fork against the subject **Mastoid Process** on the same side. Conduction deafness may be present if the subject is not able to hear the tuning fork sound again.

2. Repeat the procedure with the other ear.

3. Did you get the same results with both ears? _____

4. Why is the *Rinne test* a logical test for conduction rather than nerve deafness?

The Weber Test: This test can be used to determine relative conduction and nerve deafness.

1. Have the subject sit quietly. The experimenter should vibrate the tuning fork and place the base (handle) on the mid-line of the forehead at the hair line.

2. If the vibration sound is heard equally in both ears, your hearing is the same in both ears.

3. If nerve damage is present, you will not hear the sound as well in the affected ear.

4. If conduction deafness is present, the sound will be louder in the weaker ear. Why would this be so?