

# Hearing Health

UNION UNIVERSITY

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RONALD H. KIRKLAND, MD, MBA

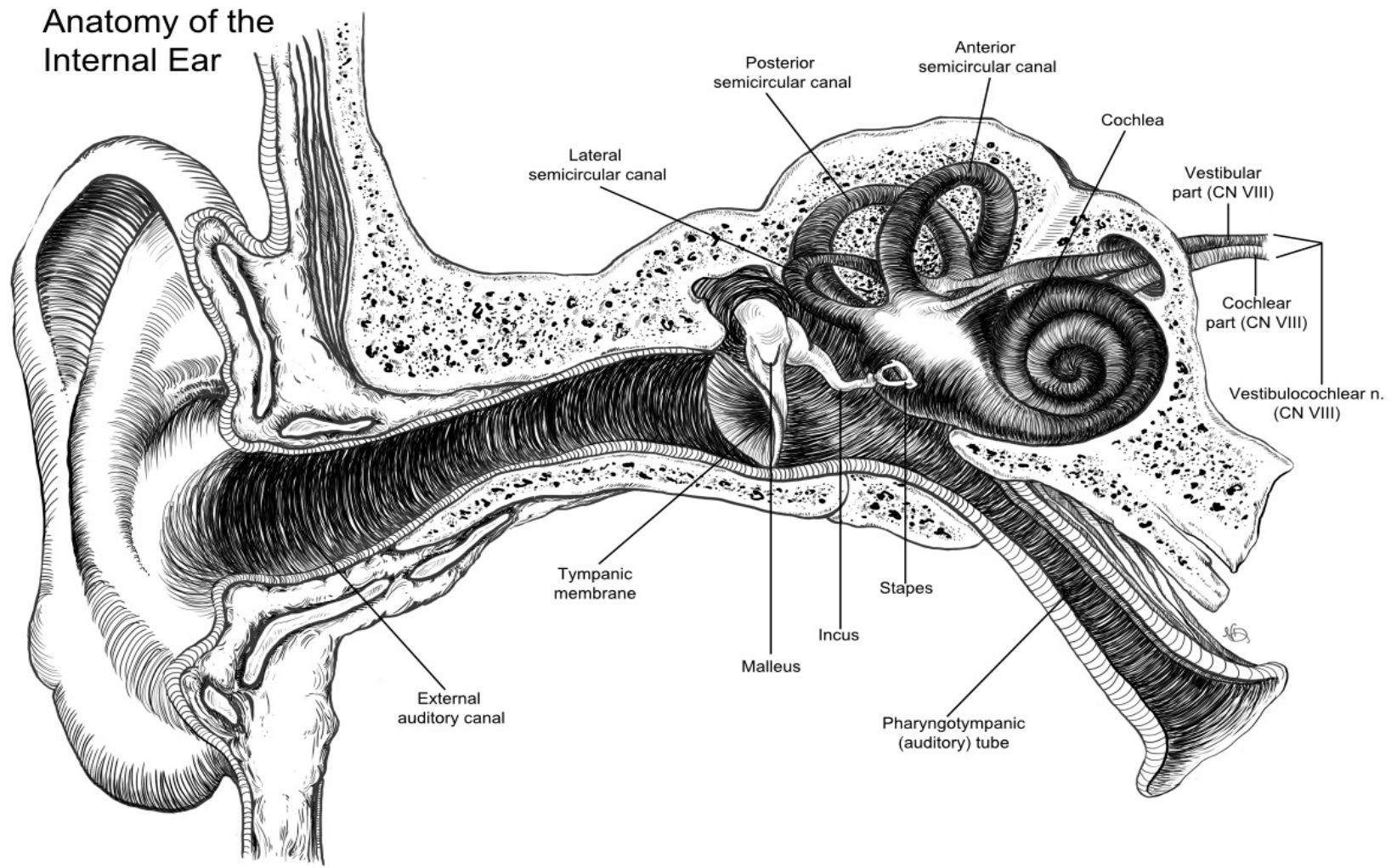
# Outline of Today's Presentation

1. Anatomy and Physiology of the Ear
2. Physics of Sound
3. Hearing Health

# Anatomy and Physiology of the Ear

1. Outer Ear
2. Middle Ear
3. Inner Ear

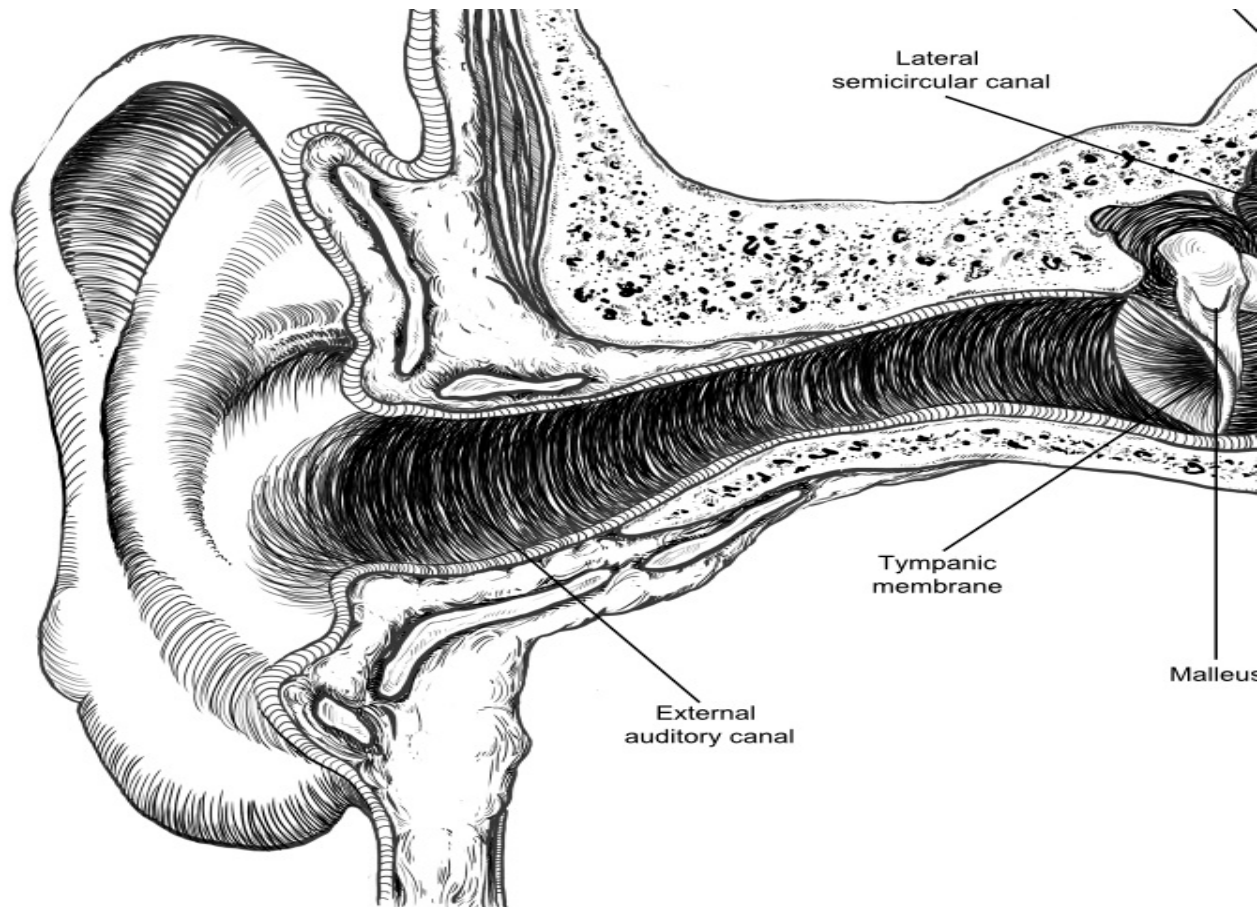
# Anatomy of the Ear



# Outer Ear

1. Pinna or Auricle
2. External Canal
3. Tympanic Membrane

# Outer Ear



# Middle Ear

1. Tympanic Membrane
2. Ossicles
3. Oval Window
4. Eustachian Tube

# Middle Ear





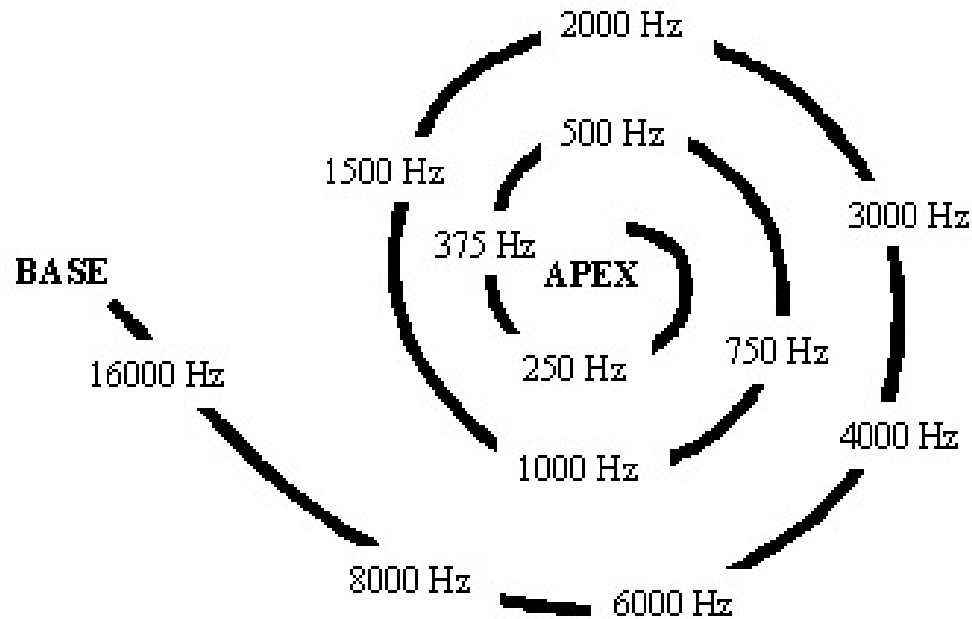
# Inner Ear

1. Oval Window and Round Window
2. Vestibule
3. Semicircular Canals
4. Cochlea

# Inner Ear



# Cochlear Frequencies



# The Physics of Sound

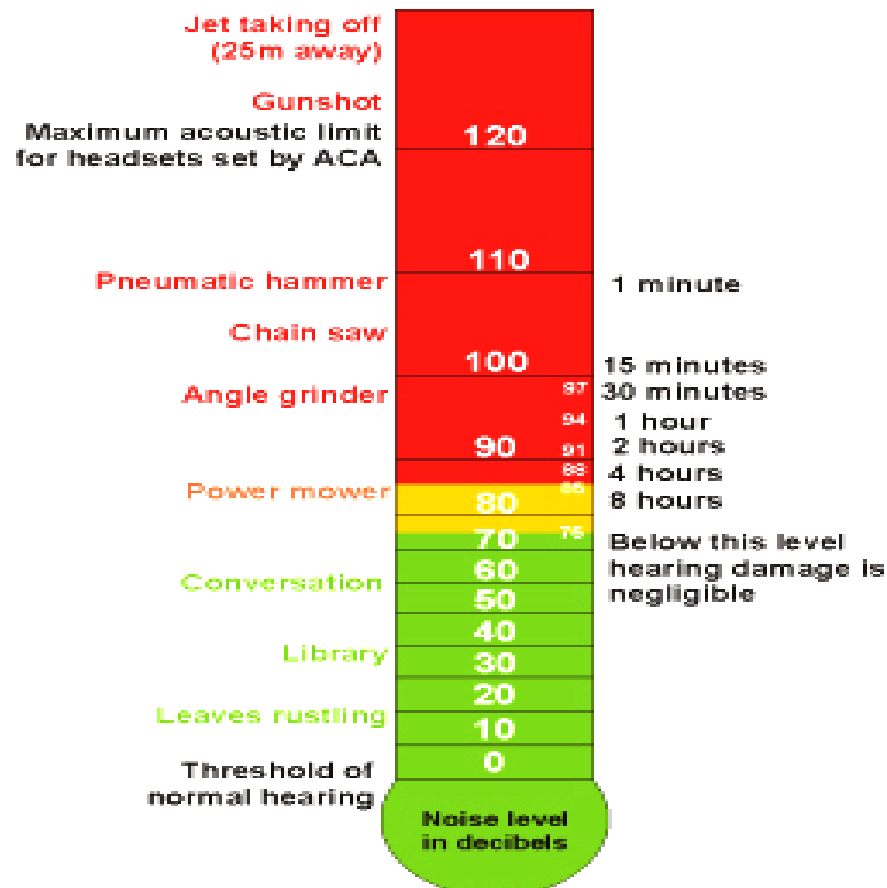


# What is Noise?

**UNWANTED**

**SOUND**

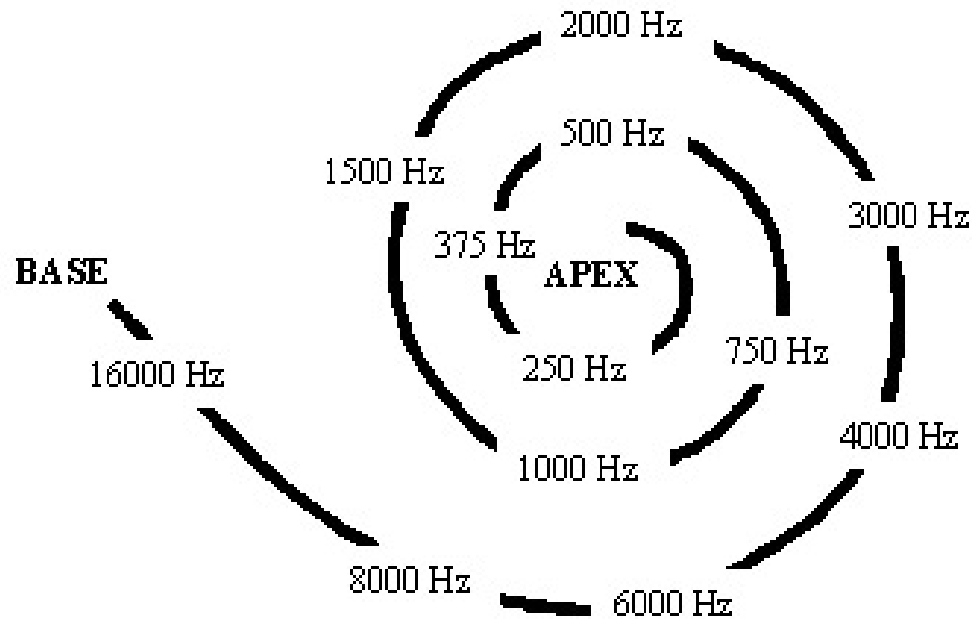
# Sound Loudness in Decibels (dB)



# Sound Pitch or Frequency



# Cochlear Frequencies

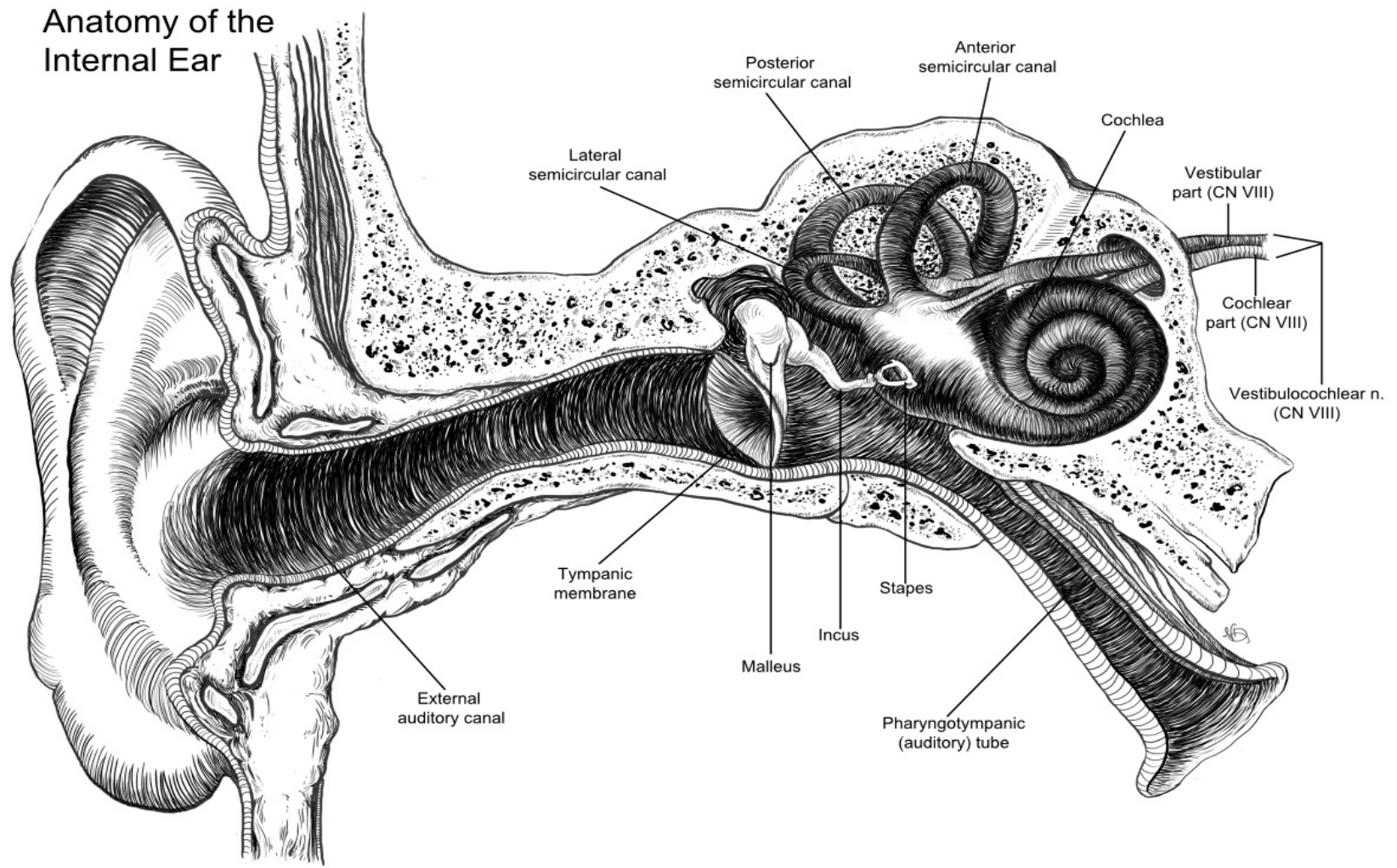




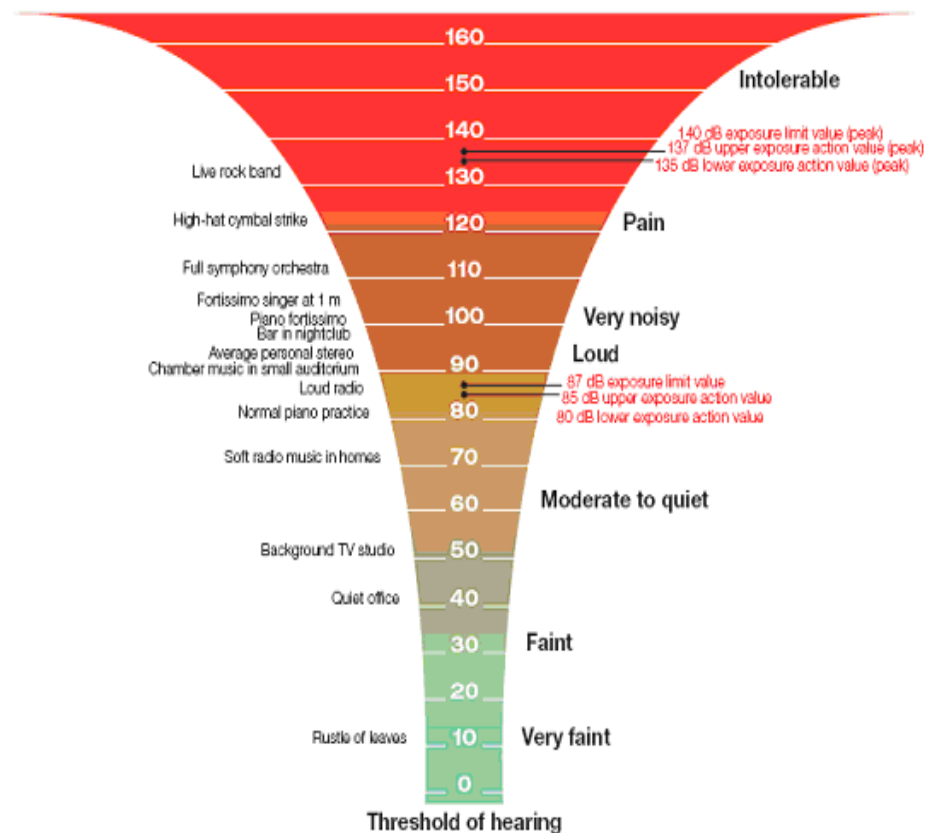
# Our Amazing Ears

<http://www.youtube.com/watch?v=ghUygePyo6Q>

# Anatomy of the Ear



# Typical Noise Levels in Decibels



# Noised Induced Hearing Loss

<http://www.youtube.com/watch?v=L24ecL4ASXo>

# Tchaikovsky's 1812 Overture

<http://www.youtube.com/watch?v=BNatwyAJ6dl>

# Hearing Loss

## Temporary or Permanent?

- \* Can sometimes be temporary and goes away within a few hours or a few days.
- \* Once it is permanent, it is irreversible and ultimately can cause deafness.
- \* Hearing aids cannot reverse it.
- \* Noise Induced Hearing Loss is totally **preventable**

# Occupational and Non-Occupational Noise Exposure

- \* Hearing loss from occupational noise exposure appears to be decreasing.
- \* Hearing loss from non-occupational noise exposure (firearms, concerts, movies, video games, computer games, personal sound systems) appears to be increasing.

# Noise Exposure Level or Noise Dose

- \* Noise level of 105 dB (bar band) for 5 minutes
  - \* equals
- \* Noise level of 94 dB (nightclub bar) for 1 hour
  - \* equals
- \* Noise level of 88 dB (chamber music) for 4 hours



# Identical Noise Exposure or Noise Dose

- \* 80 dB for 8 hours
- \* 83 dB for 4 hours
- \* 86 dB for 2 hours
- \* 89 dB for 1 hour
- \* 92 dB for 30 minutes
- \* Equal Energy Principle

# Symptoms of Hearing Damage

- \* Can be temporary or permanent
- \* Can be caused immediately by sudden loud noise
- \* Usually gradual
- \* May include tinnitus (ringing or roaring in ears)
- \* May include distortion of sound perception

# Hearing Loss Video

\* <http://www.hse.gov.uk/noise/video/hearingvideo.htm>

# Hearing Myths

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- \* If I get a hearing test or admit that I have hearing loss, I may lose my job.

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- \* Audiences will be wearing ugly hearing protection
- \* If I like music, it won't damage my ears

# Yes, You Have A Problem in Your Workplace if:

- \* A noise is intrusive
- \* You or your co-workers have to raise their voices to carry on a conversation
- \* You or your co-workers use noisy equipment for more than 30 minutes a day
- \* Your field is known to have noisy tasks, e.g. musicians or others in the musical field.



# Factoid

- \* Approximately 44% of college students in one study admitted to using noisy equipment without ear protection. Male students were twice as likely to do so than female students.
- \* Findings are similar to other studies that suggest that male students are more likely than female students to engage in risky behavior.

# Signs That You May Have A Problem

- \* When I am listening to my music using my headphones, people next to me can hear my music
- \* [http://www.youtube.com/watch?v=kLSYq5kau\\_w](http://www.youtube.com/watch?v=kLSYq5kau_w)
- \* "it ain't no fun, man, it ain't no fun,
- \* When you're 20 years old and your ears are 81"

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- \* I really don't think I'll lose my hearing until I'm older

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- \* I don't believe that loud music can cause hearing loss
- \* Even if I lose my hearing, it can be "fixed" with hearing aids
- \* I don't wear hearing protection during concerts because I feel the music is more difficult to hear when I wear hearing protection

# How Does Hearing Loss Sound?

\* <http://www.hse.gov.uk/noise/demonstration.htm>

# Hearing Health Surveillance A Suggestion for Musicians

- \* A baseline audiogram

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- \* Musicians may want to keep their own records of estimated daily and weekly sound exposure
- \* Download free sound meter app!

# Take Home Lessons

- \* You are ultimately responsible for your own hearing health

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- \* Remember the three elements necessary for hearing loss to occur – loudness, duration, and you

# Noise Exposure Triangle



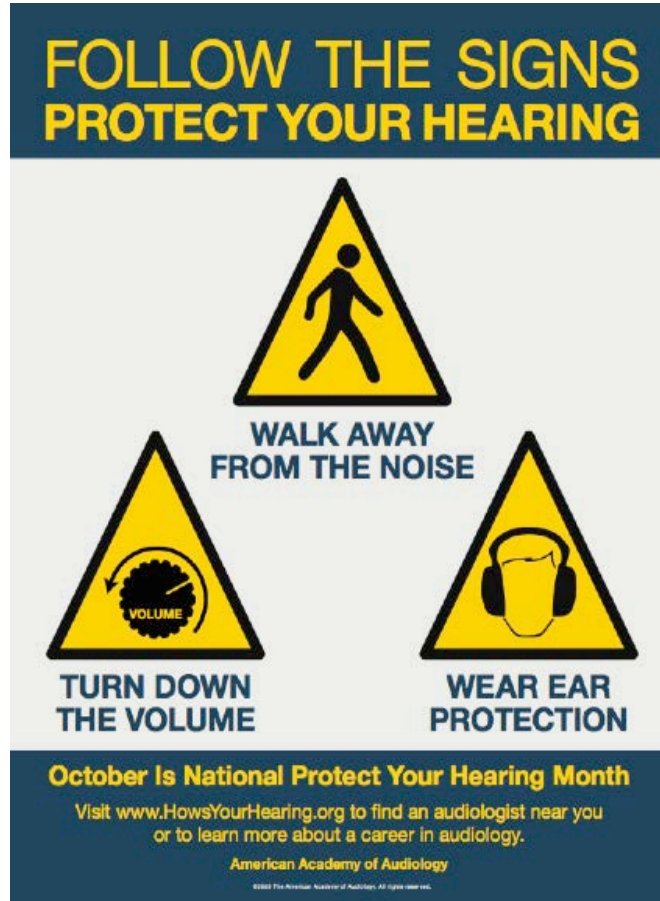
Remove any element and overexposure to noise is prevented

Reduce **loudness** or **duration** and exposure is reduced

# Take Home Lessons

- \* You are ultimately responsible for your own hearing health
- \* Remember the three elements necessary for hearing loss to occur – loudness, duration, and you
- \* Remember the three things you can do about loud noise – walk away from the noise, turn down the volume, and wear hearing protection

# Protect Your Hearing



# Take Home Lessons

- \* Remember the Three Decibel Rule – the sound energy doubles with every three dB increase in sound

# Take Home Lessons

- \* Remember the Three Decibel Rule – the sound energy doubles with every three dB increase in sound
- \* If a sound hurts your ears, do something!



# NO Q-TIPS !!!!



# F-18 Fighter Breaking Sound Barrier



# Fun Website

<http://www.dangerousdecibels.org/virtualexhibit/index.html>