

Noise Induced Hearing Loss

The background is a dark blue gradient. A thin, light blue curved line starts from the left edge and curves downwards towards the center. A larger, semi-transparent blue wedge shape is positioned in the lower right quadrant, pointing towards the center.

Noise Induced Hearing Loss

- Definitions
- Acoustic Trauma vs. Chronic NIHL
- Physiology/Pathophysiology/Histopathology
- Susceptibility and Interactions
- Hearing Impairment vs. Hearing Handicap vs. Disability
- Legislation and Worker's Compensation

Noise

- An unwanted or unpleasant sound.
- An intense sound capable of damaging the inner ear.
- Temporal patterns
- Measurement of noise
- A-scale

Acoustic Trauma

- Sudden, permanent SNHL caused by single exposure to an intense sound.
- Impulse sound, 130-140dB
- Presentation
- Examination
- Audiogram
- Management

Chronic NIHL

- Gradual hearing loss occurring over years of exposure to noise.
- Prevalence
- Industrial vs. Non-industrial
- Temporary Threshold Shift
- Permanent Threshold Shift

Chronic NIHL

- Damage Risk Criteria
 - Total sound energy
 - Every 3dB increase in sound intensity leads to a doubling of sound pressure.
- OSHA Regulations
 - 5dB rule
 - Allowable levels
 - 90dBA for 8 hours
 - 95dBA for 4 hours
 - 100dBA for 2 hours
 - 105dBA for 1 hour
 - 110dBA for 30 minutes
 - 115dBA for 15 minutes

Chronic NIHL

● Defining Characteristics

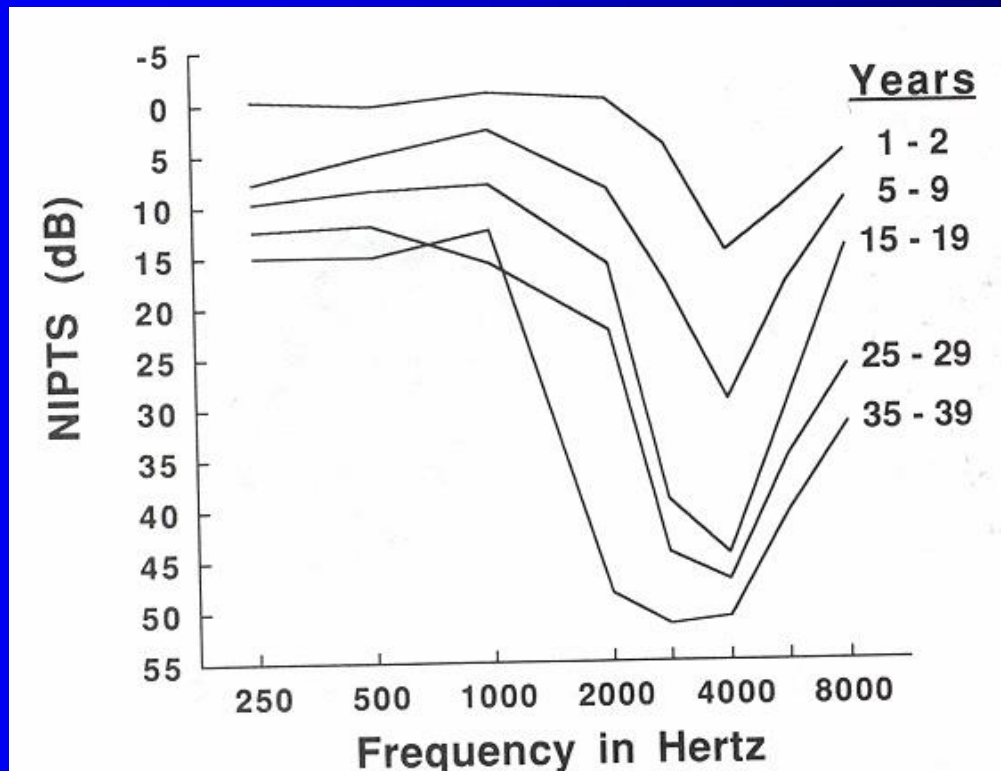
- Always sensorineural
- Nearly always bilateral and symmetric
- Does not produce a profound hearing loss
- Will not progress once noise exposure discontinued
- Rate of loss decreases as threshold increases
- Most severe loss at the 4kHz frequency
 - 3-6kHz losses are greater than 500Hz-2kHz
- Maximum loss seen after 10-15 years of exposure
- Continuous noise is more damaging than intermittent noise

American College of Occupational Medicine

Noise and Hearing Conservation Committee

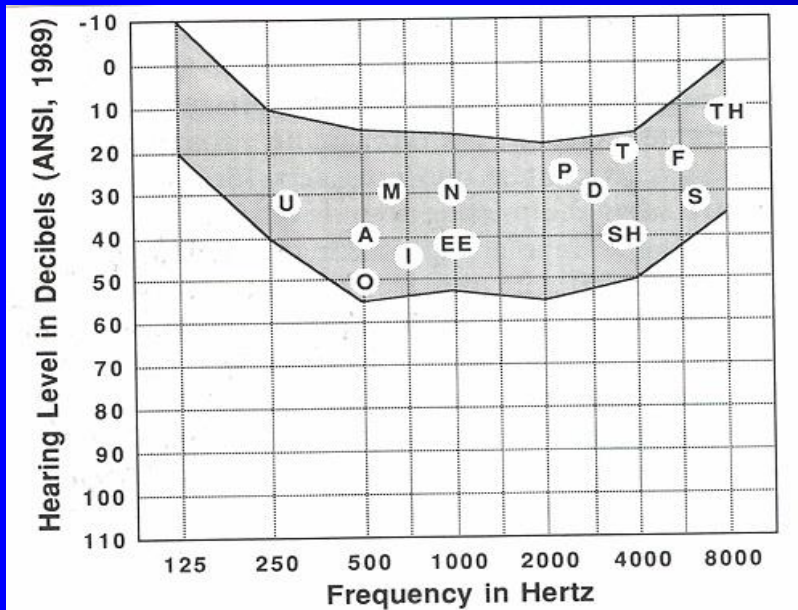
Chronic NIHL

- Defining Characteristics

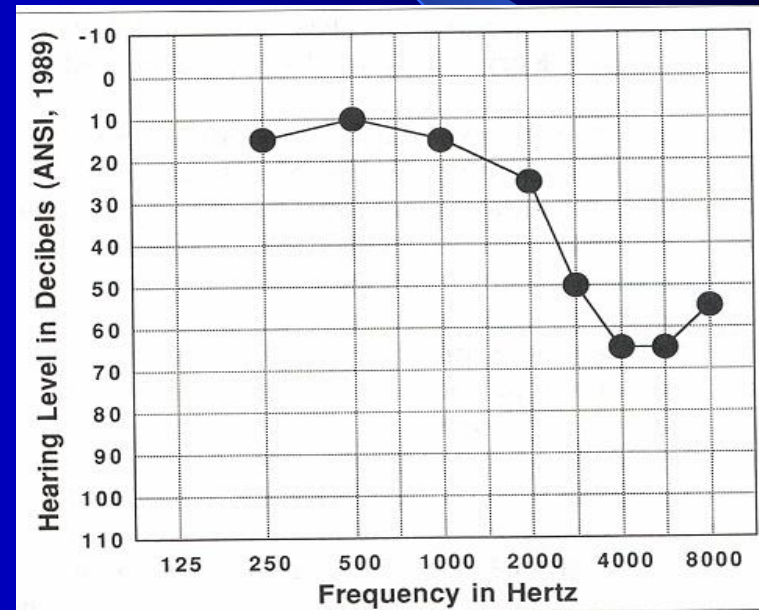


Chronic NIHL

- Presentation



- Audiogram



- Examination

- Management

Chronic NIHL

- Hearing Conservation Programs
 - Assessment of Noise Levels
 - Engineering Controls
 - Administrative Controls
 - Personal Hearing Protectors
 - Serial Audiograms

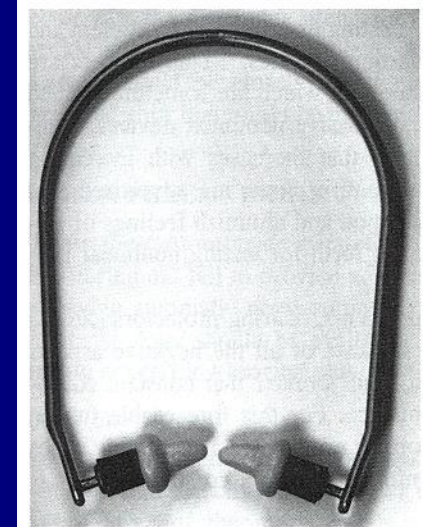
Chronic NIHL

- Personal Hearing Protectors

Earplugs

Earmuffs

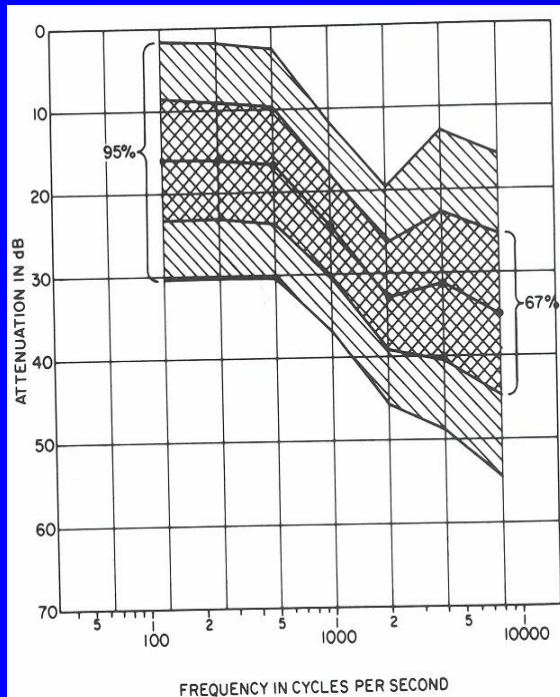
Canal Caps



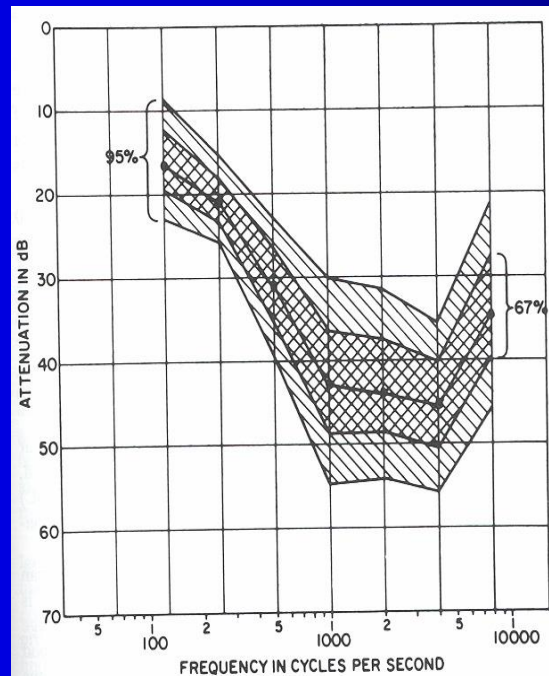
Chronic NIHL

- Personal Hearing Protectors—Attenuation

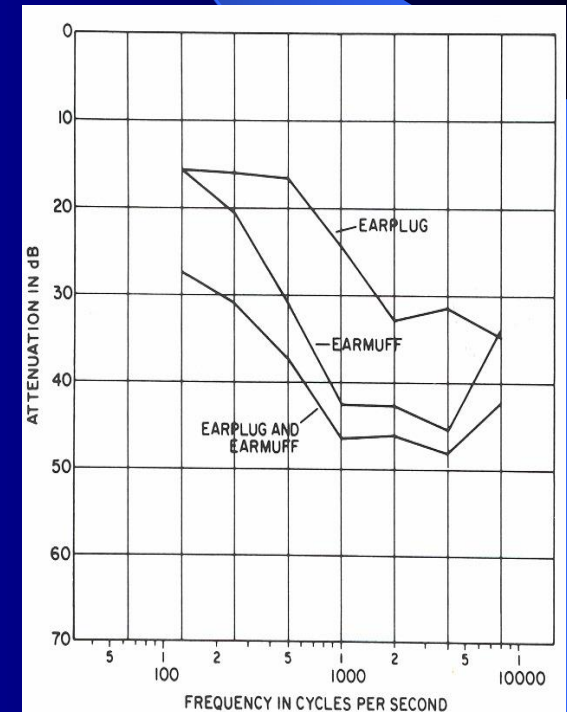
Earplugs



Earmuffs



Both



Physiology/Pathophysiology

- External Ear

- Resonant frequency = speed of sound/4 x EAC length

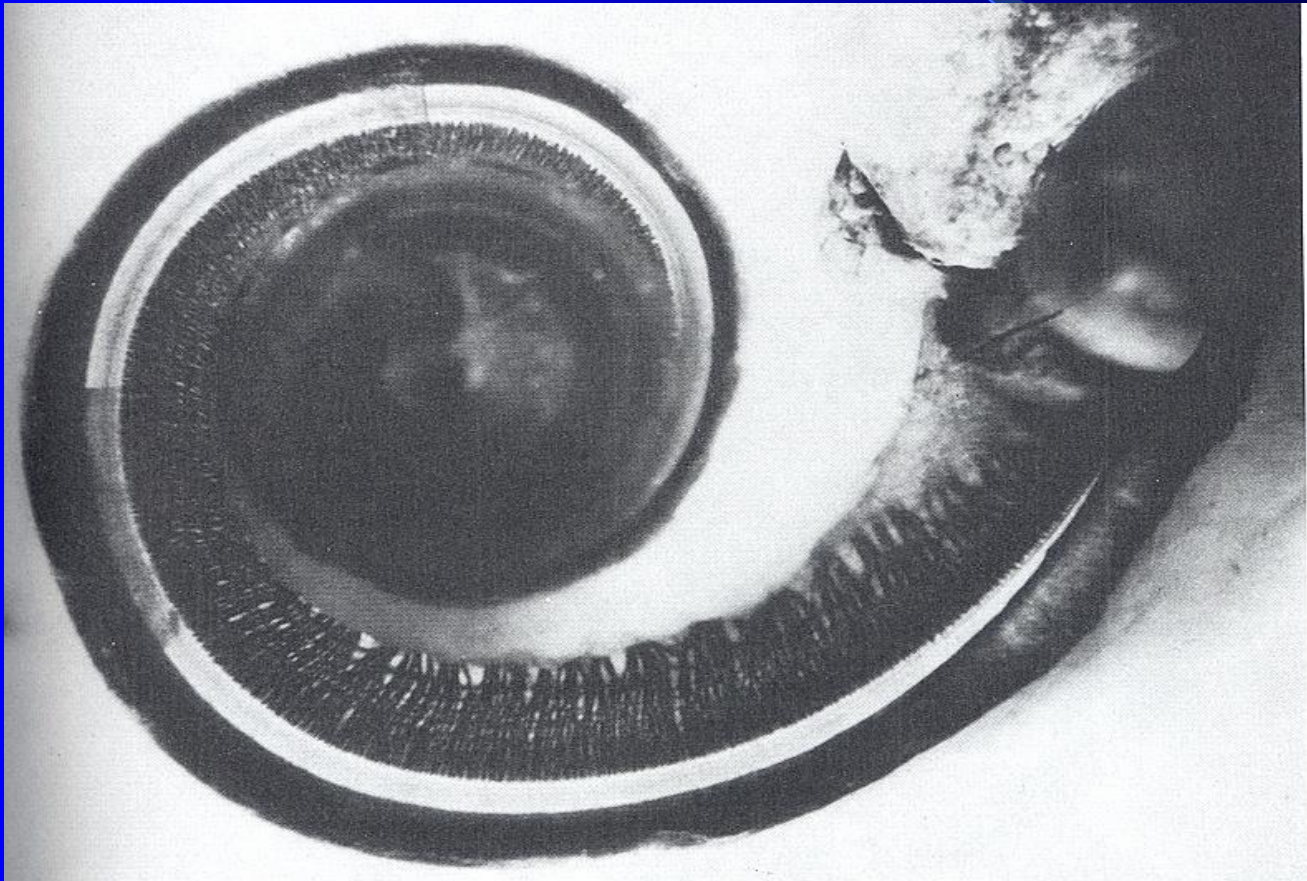
- Middle Ear

- Acoustic Reflex

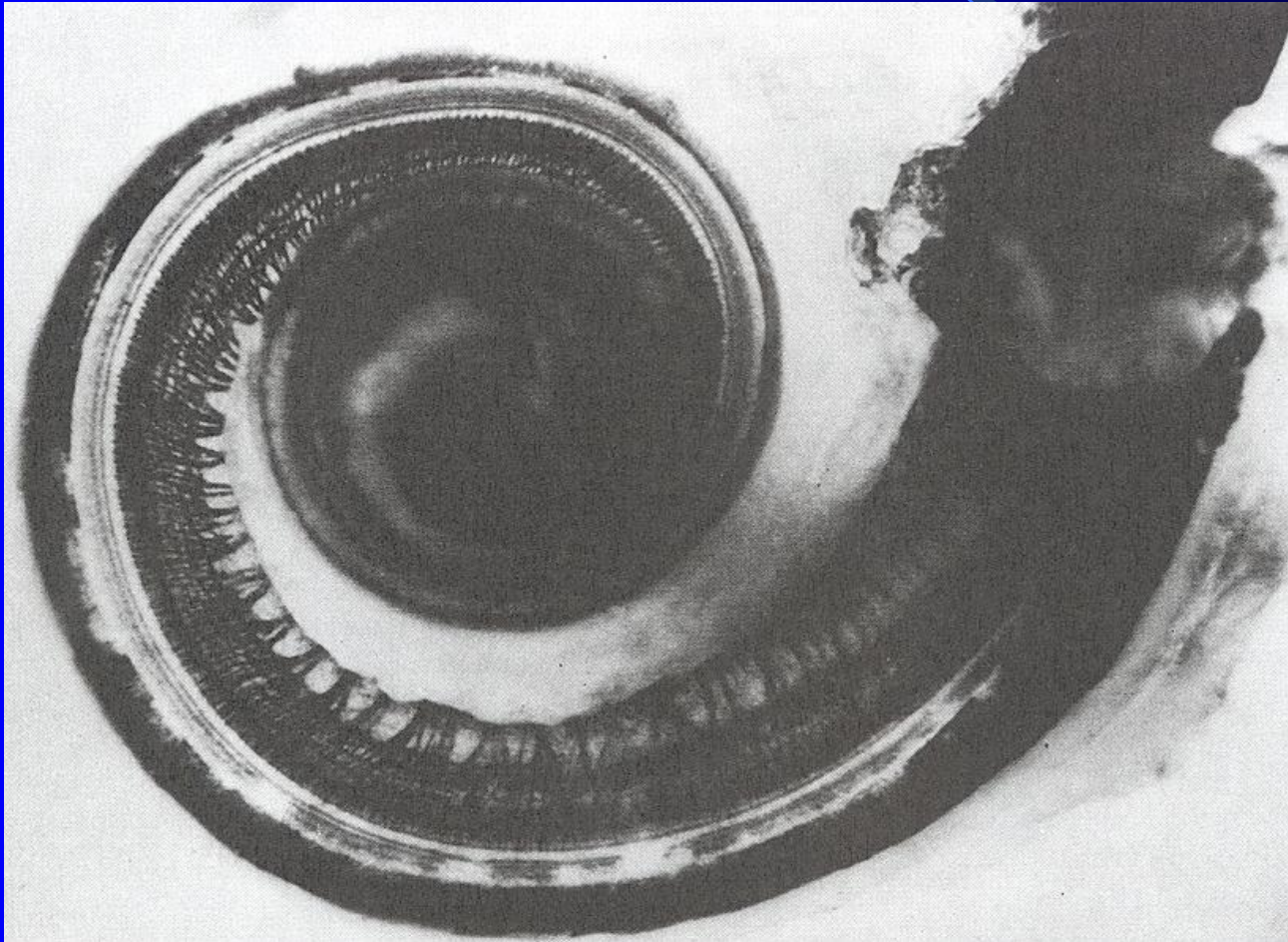
- Inner Ear

- IHC vs. OHC
- Supporting cells
- Nervous structures
- Blood vessels

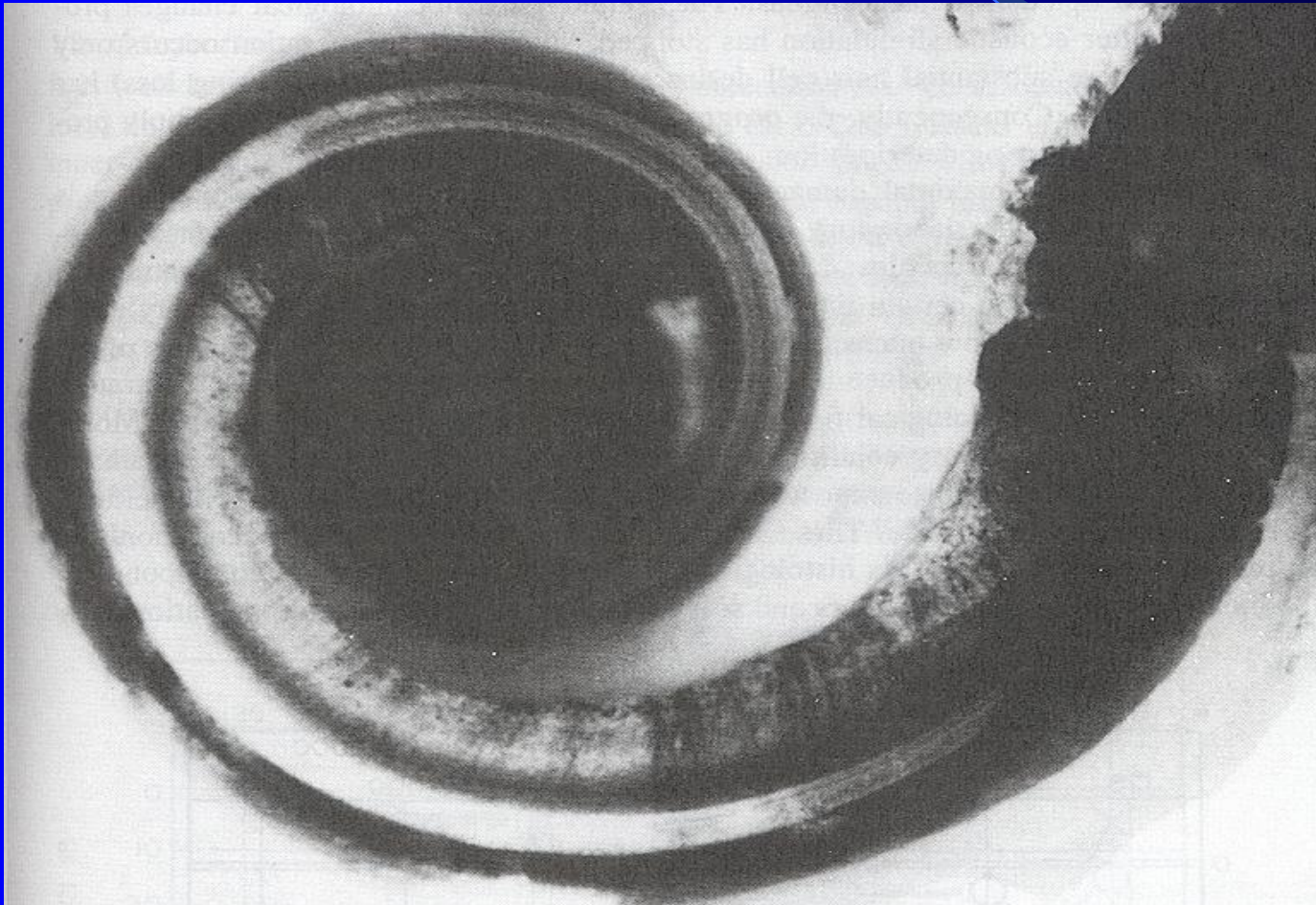
Histopathology



Histopathology

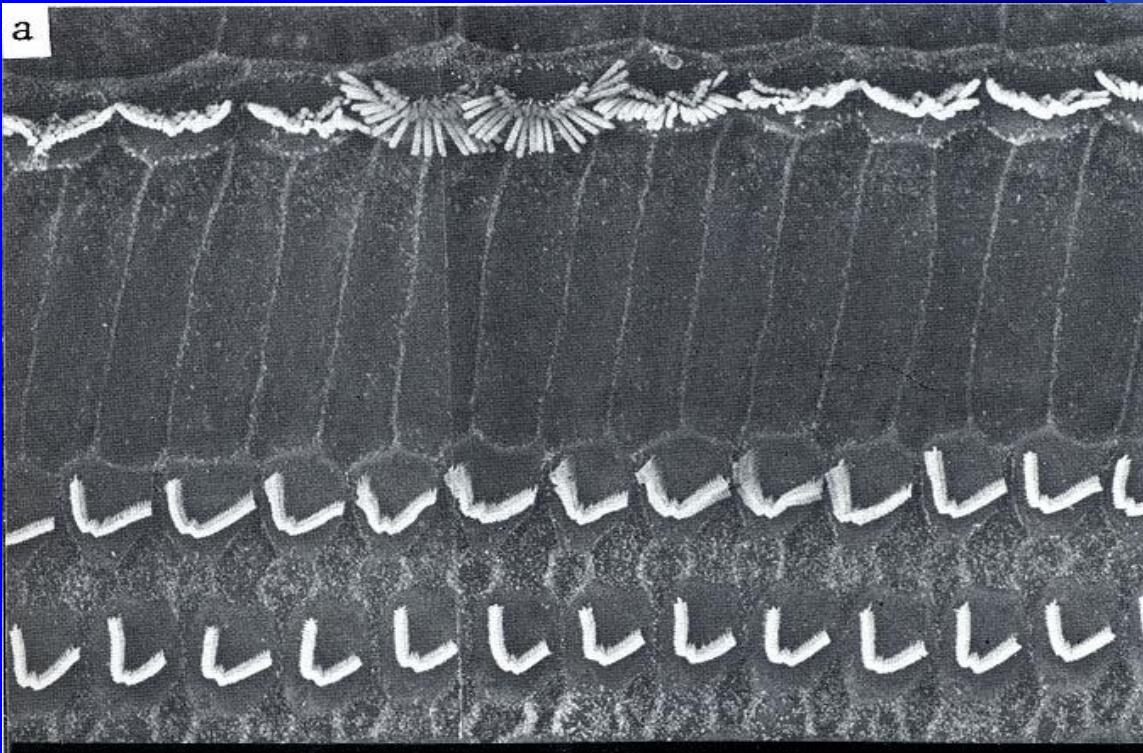


Histopathology



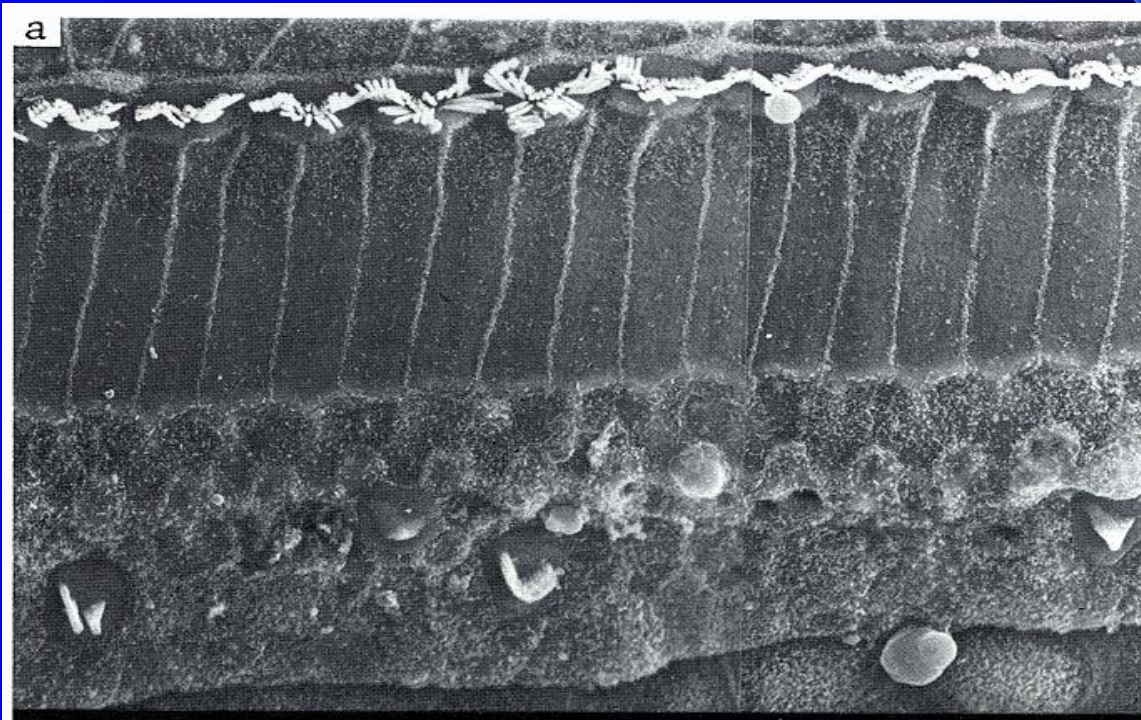
Histopathology

- Acoustic Trauma



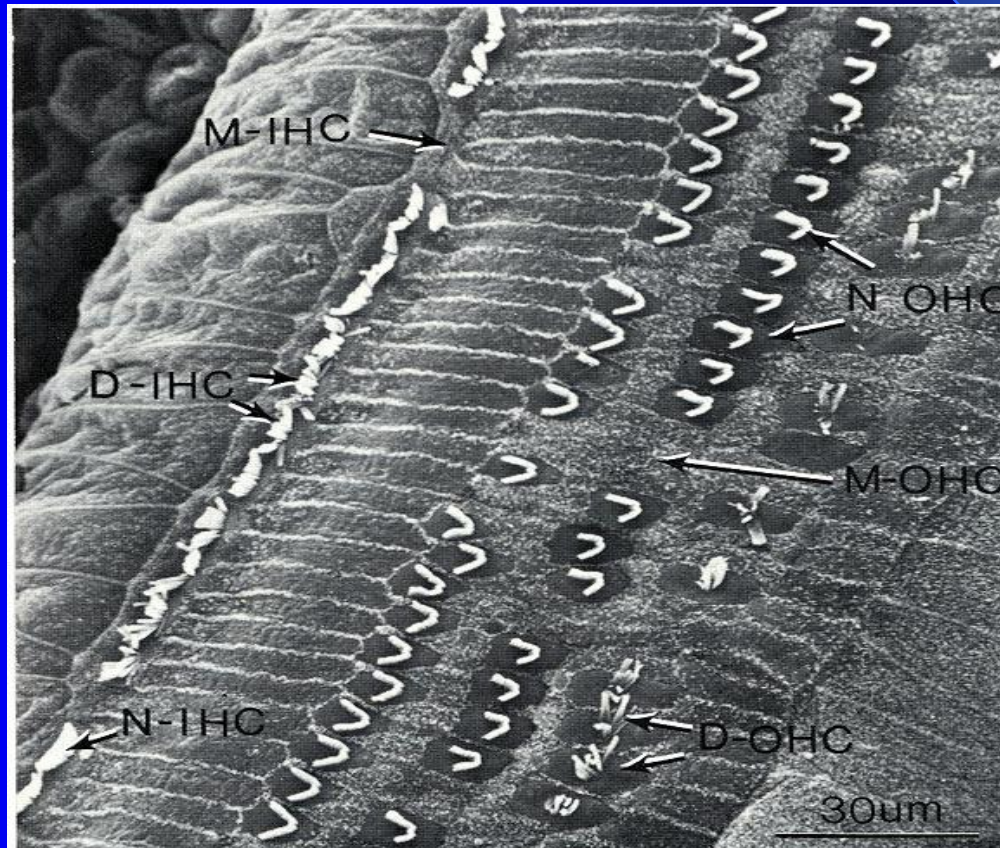
Histopathology

- Acoustic Trauma



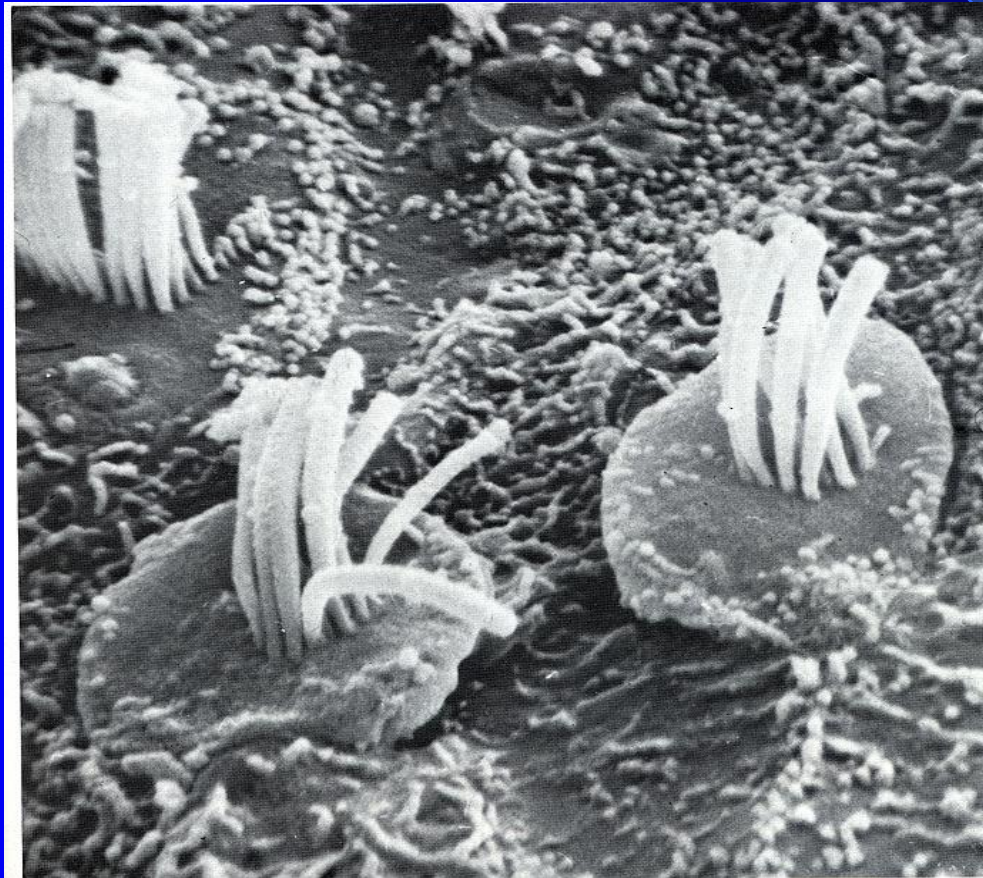
Histopathology

- Industrial Noise



Histopathology

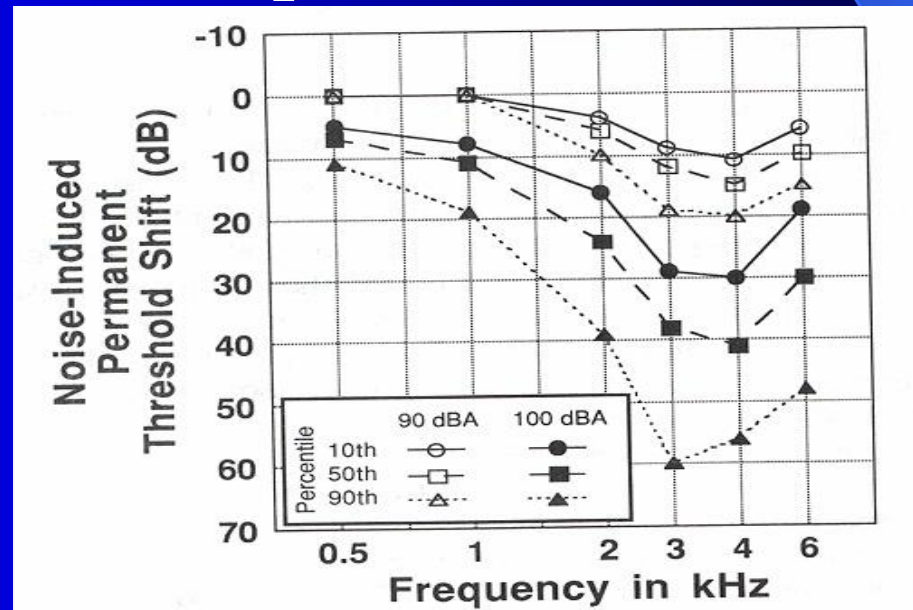
- Industrial Noise



Susceptibility

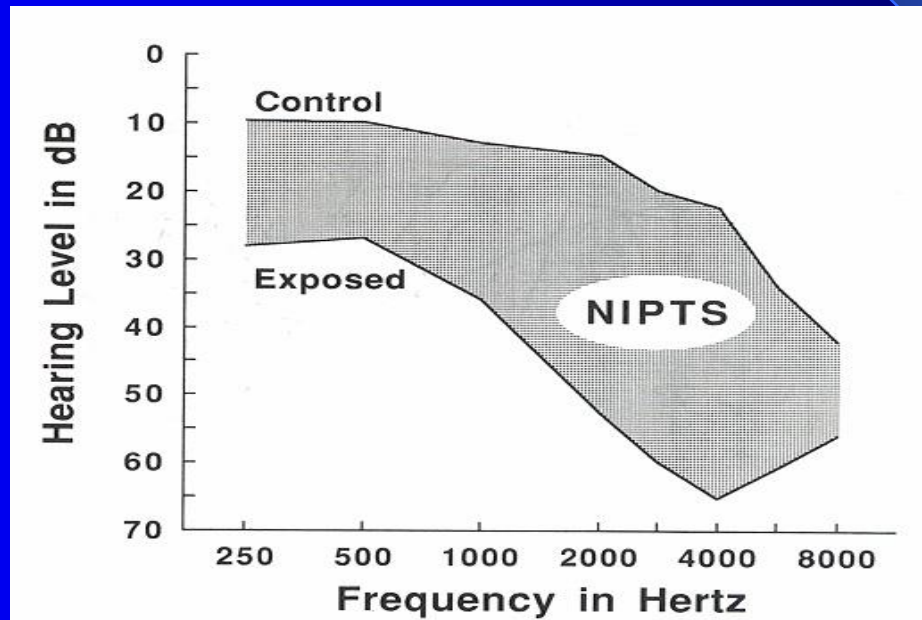
- 5% of individuals exposed to 80dBA noise levels develop a significant hearing loss.
- 5-15% for 85dBA exposure
- 15-25% for 90dBA exposure

- Why?



Interactions

- AIHL vs. NIHL



- Total HL = NIHL + AIHL - $\frac{(NIHL)(AIHL)}{120}$

Interactions

- Presbycusis
- Ototoxic drugs
 - Aminoglycosides
 - Cisplatin
 - Lasix
 - Aspirin
- Chemicals
 - Toluene
 - Carbon monoxide
 - Carbon disulphide
- Vibration

Impairment/Handicap/Disability

- Hearing Impairment
 - “a change for the worse in either structure or function, outside the range of normal”
- Hearing Handicap
 - “the disadvantage imposed by an impairment sufficient to affect a person’s efficiency in the activities of daily living”
- Disability
 - “an actual or presumed inability to remain employed at full wages”

Hearing Handicap

AAO-1979 Rule

- Establish thresholds at 500Hz and 1-3kHz
- Calculate average monaural thresholds
- Assume handicap begins when thresholds exceed 25dB and increases by 1.5% for each additional decibel loss
- Apply 5:1 weight favoring the better hearing ear

$$HH = \frac{5(MI_{\underline{b}}) + (MI_{\underline{w}})}{6}$$

Legislation

- Walsh-Healy Public Contracts Act, 1969
- Occupational Safety and Health Act, 1970
- Clean Air Act, 1970
- Bulletin #334, 1971
- Noise Control Act, 1972
- Hearing Conservation Amendment, Final Rule, 1983

Worker's Compensation

- Provides payment to cover lost wages and medical expenses accrued by a worker as a result of an injury sustained on the job.
- Based on hearing handicap, most often as calculated by the AAO-1979 rule.
- Otolaryngologist's role:
 - Complete history and physical
 - Audiogram
 - Diagnostic conclusions