

# OCCUPATIONAL HEARING IMPAIRMENT

# SOUND DEFINITIONS

- Sound consists of physical pressure fluctuations that are characterised by amplitude, frequency and time pattern
- Frequency-the rate at which the pressure fluctuations repeats in a sinusoidal curve

The range of human hearing is :

20Hz-20 000Hz

# Classes of Noise

- -Continuous noise: is produced by high velocity air flow in compressors, fans, gas burners, and motors. Crushing, drilling, and grinding are important sources of continuous noise.
- - Impact noise: results from sharp or explosive inputs of energy into some object or process, such as hammering or pounding on metal, dropping heavy objects.

# Attention:

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- In many industrial situations impulsive noise components are superimposed on a background of continuous noise.

# Categories of Hearing Loss

- Acoustic trauma
- Temporary treshhold shift (TTS)
- Permanent treshhold shift (PTS)

# Classification of Noise-Induced Hearing Loss (NIHL)

- A. Auditory Health Effects
- B. Non-auditory Health Effects

# Acoustic trauma

- Onset of hearing loss is instantaneous
- May also suffer from tympanic membrane perforation(s), or disarticulate the ossicles
- Followed by immediate pain, a tickling sensation, vertigo, tinnitus, reduced communication skills...
- Caused by blasts or explosions

# Level of the Noise in the Environment

| Level of the sound<br>dB | Effects                          | Source                                     |
|--------------------------|----------------------------------|--|
| <b>140</b>               | <b>Acoustic trauma</b>           | Aircraft engine                            |
| <b>130</b>               | <b>Level of the pain</b>         | stamping                                   |
| <b>120</b>               | Extremely strong noise           | Start of the military<br>airforce airplane |
| <b>110</b>               | Very strong noise                | bigbeat                                    |
| <b>90</b>                | <b>Strong noise –health risk</b> | Tram, track,mixer                          |
| <b>70</b>                | Lower level of noise             | Classroom, TV                              |
| <b>50</b>                | Light sound                      | Pedestrian in the night                    |
| <b>40</b>                | silence                          | clock                                      |
| <b>20</b>                | Deep silence                     | Snow forest                                |
| <b>10</b>                | <b>Hearing level</b>             |  |



# Noise in the Workplace

The most common risk factor among hazardous workplace exposures.

- airports, construction sites, heavy machinery, service of the compressor stations
- stamping, pressing
- wood industry, textile industry (operators,
- service of the vehicles and construction machines, miners, ...

# Health Effects of Noise

## A) Specific-auditive

- Effect on ear leads to temporary or permanent impairment

## B) Non-specific- extraauditive

blood hypertension, sleeping disturbances, mood disturbances, neurosis, ... stress reaction

• .....  
• ss

# Examination of the hearing

Methods of the detection of hearing defects

- **Speech audiometry-provides essential diagnostic information**
- **Tympanometry- used to assess the function of the conductive auditory mechanism. Sensitive technique.**
- **Audiometry (pure-tone audiometry)**
- **Tuning fork test**

# Hearing Impairment

- 1. Conductive Deafness
- 2. Sensorineural Deafness
- 3. Combination

# Occupational Hearing Loss

## acute

- **Explosion trauma of the ear**
- **Acoustic trauma of the ear gr. I.–III.**

## chronic

- **hypacusis perceptiva bilateralis profess.**

Ototoxic substances in the workplace:

As, Co, Pb, Hg, Li, cyanide, benzene, carbon disulfide, aniline, industrial solvents

# Acute explosion trauma

- From the sudden press difference in the middle ear and in surrounding environment
- Mechanical
- Damage of the ear drum, middle ear and inner ear (labyrinth)
- pain, hemorrhage the middle ear , hearing impairment in the wide frekv. zone , titubatio

**mixed hearing loss  
conductive-perception bilat.**



# Acute acoustic trauma

- Outcome of one sudden noise impulse
- 
- missing protective mechanism of the ear, sudden change of the pressure makes mechanical damage of the sensor. cells in the inner ear, eardrum, middle ear bones
- Painful pressure in the ear, tympanophony, tinnitus, temporary hearing loss (4 kHz)
- In case of recurrence permanent hearing loss

**perceptive type of hearing loss  
unilat. (one ear)**



# Chronic hearing impairment

- **bilateral permanent hypacusis induced by long term exposition of the excessive noise**
- Loss of sensory cells – irreversible changes
- hypacusis= partial hearing loss, which often costs problems in communication

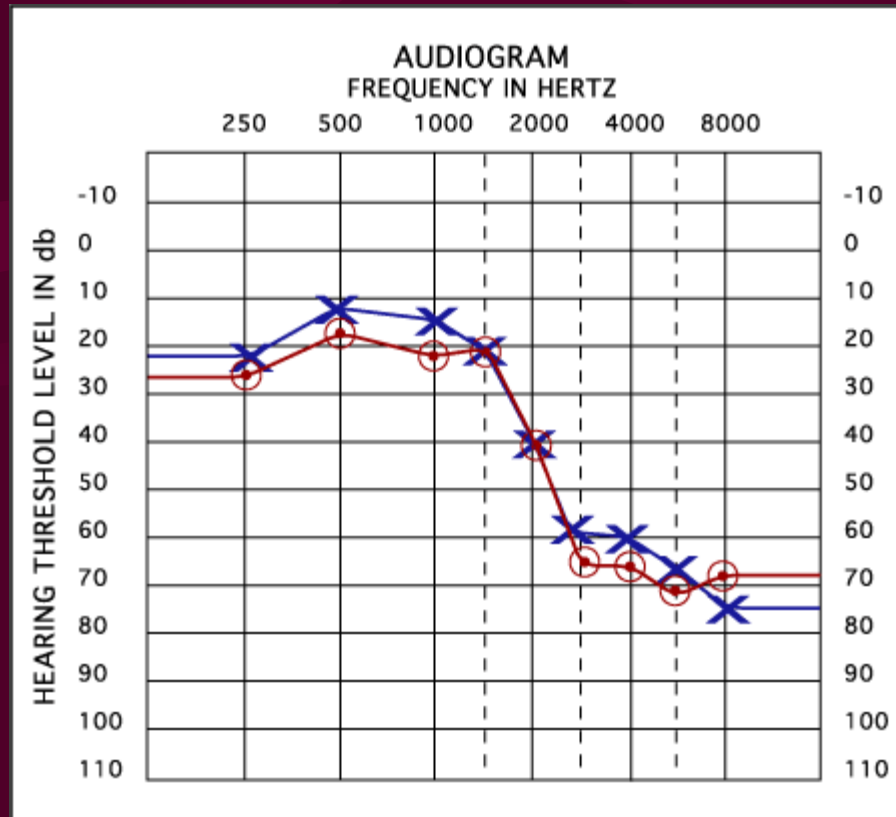


# Audiometric Examination Procedures





# AUDIOGRAM



# Characteristic

- Permanent irreversible hear impairment (manifested on „speach frequenties“)
- Treatment is not efficient
- Combination of the noise exposure in working and communal environment and (senile) presbyacusis

# Evidence of Hearing Loss

- Early signs of hearing loss include:
  - 1. Difficulty in understanding spoken words in a noisy environment
  - 2. Need to be near or look at the person speaking to help understand words
  - 3. complaints that people do not speak clearly
  - 4. Ringing noises in the ear

# Hearing Loss as Occupational Disease

noise-induced hearing loss

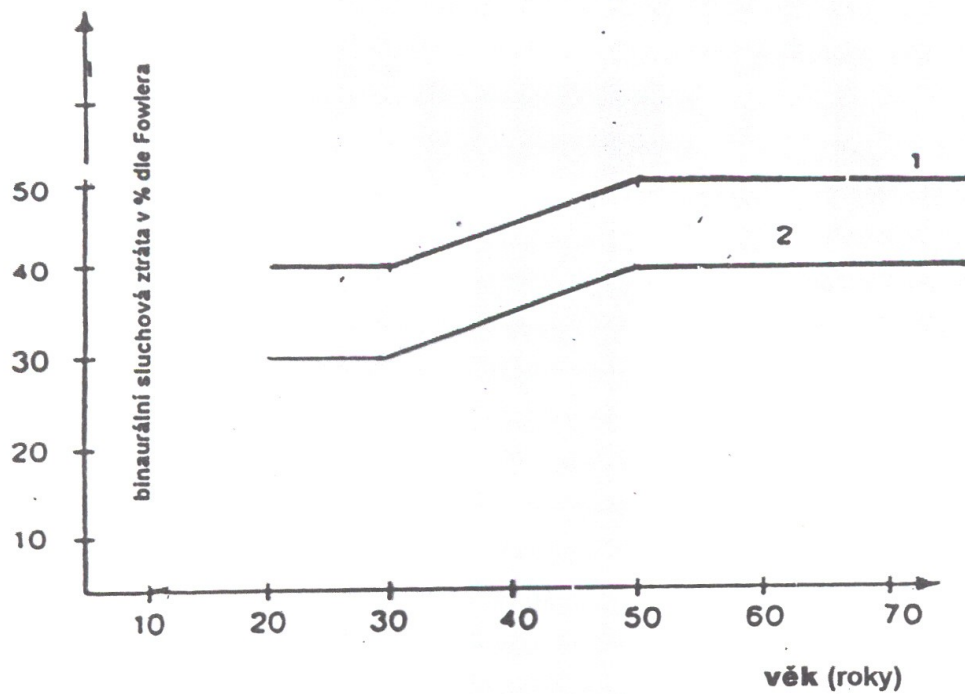
**total hearing loss 40- 50% according  
the age (methodology by Fowler)**

- Condition of origin occupational disease  
disease starts during the work with proved excessive  
exposition to the noise = over 85 dB/shift, impulsive  
noise exceeded 140 dB in the peak

# Audiogram

- A graf showing hearing (treshhold)level as a function of frequency,
- Result of AUDIOMETRY- measurment of hearing
- Hearing level: number of decibels that the subjects treashold of hearing lies above the zero reference for that frequency.
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- Noice-induced hearing loss (NIHL) is first detected on pure tone audiometry, measured at 250,500,1000,2000,3000,4000,8000Hz
- Tresholds in hearing are expressed in decibels (dB)
- Normal range at each frequency 0-20dB
- Evaluation //
- Mild: NHILwith losses 20-40 dB
- Moderate: 40-60 dB
- Severe: 60-80 dB
- Profound: more than 80 dB

**Graf pro hodnocení poruch sluchu pracovníků v riziku hluku**



**1: hranice pro ohlášení nemoci z povolání**

**2: hranice pro ohlášení ohrožení nemoci z povolání**



# Assesment of Proffessional Hearing Loss

- As occupational disease is considered and proved hearing impairment caused by noise leading to binaural hearing loss according Fowler:
  - patient up to **30 years old** - more than **40%**
  - patient over 50 years old - more than **50%**
  - patient **30-50 years** - limit 40% **plus**  
**0,5% for each year of age**
- Hygienic examination at the workplace proves, that the condition for origin of occupational disease had been fulfilled



## Prevention

- Technical- modification of the work procedures creating noise
- Organizational – removal of the worker from a noisy environment ,regular breaks
- Use of Personal Protective Equipment-earmuffs, earplugs
- Employment Preplacement Examination, Periodic Health Examinations

Thank you for your attention