

## Hypoacusis or deafness caused by noise

### Definition of causal agent

Sound is an ondulatory phenomenon by means of which mechanical vibration energy is propagated through an elastic medium, generally air, giving rise to auditory perception. Noise is a class of sounds that are disturbing, harmful or detrimental to hearing.

This document covers only the effects of noise to the auditory system. The risk of noise induced chronic hearing loss depends on the cumulative cochlear noise exposure, which is determined by daily noise exposure level, including impulsive noise, and exposure time in years.

### Adverse effects

#### 1. Acute effects

##### *Neurosensory effects*

Dizziness, tinnitus, hypoacusis which can lead to total deafness.

The auditory deficit in acute acoustic trauma is neurosensory or mixed (both conductive and neurosensory), symmetric or asymmetric depending on symmetry of exposure, and generally partly reversible, depending on the energy of the sound wave and the duration of exposure.

##### *Physical damage:*

Laceration of the tympanic membrane, with bleeding.

The site of the lesion is in the tympanic membrane, middle ear and cochlea.

##### *Exposure criteria:*

*Minimum intensity of exposure:* Occupational exposure assessed by:

- History and study of working conditions providing evidence of sudden exposure to a very loud noise (above 140 dB).

Importance of the notion of suddenness of the causal phenomenon (bang, explosion, etc.)

*Minimum duration of exposure:* Brief.

*Maximum latent period:* The symptoms should appear immediately or at most within two days after exposure to the noise.

#### 2. Chronic effects

##### *Occupational hearing loss:*

The disease develops slowly and insidiously. It is possible to distinguish various phases which characterize how serious the condition has become. Tinnitus can be heard in each phase. Hypoacusis is characterized by a quantitative reduction in auditory sensitivity, by a loss of the ability to discriminate between sounds and by a qualitative deterioration in the recruitment of the acoustic signal.

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The site of the lesion is the cochlea; hypoacusis is of the neurosensory type, more pronounced on the frequencies 3 to 6 kHz. It is bilateral and generally symmetrical, irreversible but usually not progressive once exposure to noise ceased.

***Exposure criteria:***

*Minimum intensity of exposure:*

- Occupational exposure assessed by history and study of working conditions providing evidence of prolonged or repeated cochlear exposure to noise of over 85 dB(A) (A-weighted), or to repeated peak noise of over 137 dB(C) (C-weighted).
- Non-occupational exposure should be assessed

It is possible, however, that exposure to the noise levels of over 80 dB(A) and peak noise over 135 (C) dB are already a source of mild occupational hearing loss.

*Minimum duration of exposure:* Six months with 93 dB(A) daily exposure for the most susceptible individuals. Every 3 dB increase in noise exposure halves the time of onset of adverse effects.

*Maximum latent period:* Does not apply, but changes in hearing develop gradually in relationship to increasing cumulative exposure.