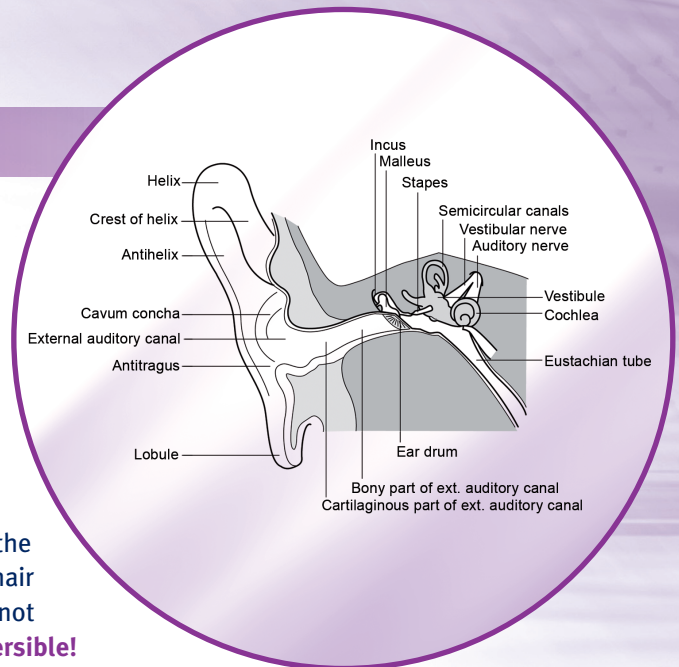


HOW DOES HEARING WORK?

Every source of sound produces vibrations that cause sound waves in the air. These are “funnelled” into the ear through the auditory canal to reach the eardrum, making it vibrate. These vibrations travel through delicate ossicles in the middle ear, which redirect the vibrations to the inner ear. There, hair cells convert them into an electrical signal that is sent to the brain. The brain perceives this as sound: music, a voice, a door closing, etcetera. Sounds that are too loud can cause the hair cells in the inner ear to become overloaded and die. The longer the exposure and/or the more the noise increases, the more hair cells will die. As the number of hair cells decreases, so does the ability to hear. Dead hair cells cannot be brought back to life, which means that this damage is **irreversible!**



WHAT IS NOISE?

Sound is caused by the vibration of an object – as is clearly visible in the movements of a loudspeaker cone. The surrounding air is compressed at intervals, thus creating a sound wave. The loudness of sound is related to the extent of that compression and the resulting degree of pressure of the sound wave. This is measured in decibels [dB]. After making a correction for the perception of the human ear, the level is given as dB(A). The scale runs from the faintest sound the human ear can perceive: “0 dB (A)” to a maximum of 180 dB(A), the noise emanating from a launching pad when a rocket is launched. Decibels are a logarithmic number. This means that if the dB number increases by 10, the intensity of the sound increases “tenfold”.

WHAT IS FREQUENCY?

A sound’s pitch is determined by the number of changes in pressure per second, and is expressed in hertz [Hz]. The human ear is able to perceive pitches between about 20 Hz (the lowest note on a large pipe organ) and about 20,000 Hz, like the sharp, high note of a dog whistle, which humans can only just hear. The ear is most sensitive to sound waves with a frequency of between 1,000 and 6,000 Hz.

WHEN DOES SOUND BECOME DANGEROUS?

People’s sensitivity to sound differs. In general, it can be said that a level of more than 80 dB(A) can damage hearing. When people have to talk more loudly to make themselves heard, the surrounding level will be 80 dB(A) or higher. The higher the level, the greater the risk of hearing damage. Very loud noises of a short duration, such as those caused by an explosion or the firing of a gun can result in pain and an immediate serious or even permanent loss of hearing. Exposure to a noise level between 80 and 120 dB can cause “imperceptible” damage - damage that people are unaware of at the time, but that they notice only when it has happened and it is too late. The longer the length of time one is exposed, the greater the damage that is caused.

HOW CAN YOU TELL WHETHER YOUR HEARING HAS BEEN DAMAGED?

Hearing loss generally develops over a period of years. Because it takes place painlessly and gradually, people hardly notice it is happening. Signs of damage are: when noise is painful, when one’s ears ring or buzz, or when one gradually starts hearing everything more quietly, such as following exposure to a loud bang or after a concert. Noise damage has nothing to do with age: it can occur at any time.

The first signs of hearing impairment are when people start having trouble hearing what others are saying, especially where several people are gathered in noisy surroundings. It becomes even more serious if one starts hearing a “continuous whistling noise” in the ear. This is called tinnitus and can be a sign of more serious hearing loss. But a reduced ability to hear can also be caused by a build-up of ear wax or an ear infection that can be cleared up easily. It is a good idea to consult a doctor if these symptoms occur in order to avoid taking unnecessary risks.



DOES NOISE AFFECT MORE THAN JUST HEARING?

Some people react to noise by becoming agitated, tired or irritated, their heart rate or blood pressure may increase, or they may suffer from heartburn. Noise can also affect the ability to perform difficult tasks by reducing concentration.

CAN EARS BE “TRAINED”?

No. Anyone who thinks they can get used to loud noises is probably already suffering hearing damage. And there is NO treatment for this – NO medicine – NO operation. Even a hearing aid cannot fully restore diminished hearing.

WHICH SOURCES CAN BE HARMFUL?

The locations / activities listed below can cause hearing damage:

Location/activity	dB(A)
Disco / Rock concert	110 dB(A)
Circular saw	105 dB(A)
Sports event	100 dB(A)
Motorcycling	95 dB(A)
Average factory noise	90 dB(A)
Noisy party	85 dB(A)
Aircraft cabin	80 dB(A)

HOW LONG DOES IT TAKE BEFORE NOISE BECOMES HARMFUL?

Noise causes hearing damage faster than you might think, as shown in the table below:

Noise level in dB(A)	Safe exposure time per 24 hours
80 dB(A)	8 hours
86 dB(A)	2 hours
92 dB(A)	30 minutes
98 dB(A)	7 minutes

HOW CAN ONE PREVENT HEARING IMPAIRMENT?

If you want to be in a noisy environment, or have to be in one, you should always wear hearing protectors. Hearing protectors reduce the intensity of the sound and therefore the risk of hearing damage. There are many types of hearing protectors available and it is important to make the right choice. But whichever choice you make: the best hearing protector is the one that is actually worn.

WHICH TYPES OF HEARING PROTECTORS ARE THERE?

Hearing protectors can be divided into two groups: ear muffs and ear plugs.

EAR MUFFS

Ear muffs surround the auricle and are sealed against the head with soft padding. A flexible headband (over the head) connects the muffs and ensures that they fit correctly.

Advantages of ear muffs

Quick and easy to use, immediately available, fit everyone, cause no discomfort if one has auditory canal problems and provide good attenuation of high frequencies.

Disadvantages of ear muffs

Unpleasant weight and pressure on the head, very uncomfortable in high temperatures, loss of “hearing direction” (localisation of the source of sound).



EAR PLUGS

Ear plugs are worn in the auditory canal or seal it to exclude the noise. Ear plugs can be divided into three groups: disposable, pre-formed and “custom-made”.

DISPOSABLE EAR PLUGS

These are made of memory foam that first has to be rolled into a compressed cylinder before being inserted into the auditory canal. Once inserted, the foam expands to its normal dimensions, sealing the auditory canal. They are intended for single use. It is essential that they are inserted correctly and deeply enough to ensure sufficient attenuation.

PRE-FORMED EAR PLUGS

These are inserted directly into the auditory canal, or seal the entrance to it. They can be used several times and can be cleaned. Here too, it is essential that they are placed correctly and deeply enough to ensure sufficient attenuation.

Advantages (disposable and pre-formed)

Immediately available and fit most users, no uncomfortable weight or pressure on the head, no discomfort in warm surroundings, no distortion of directional hearing.

Disadvantages (disposable and pre-formed)

The degree of protection is very dependent on correct insertion – practice is needed. Because they gradually work loose, it is necessary and important to keep putting them back in to ensure sufficient protection. Discomfort due to pressure in the auditory canal, limited range of attenuation levels.

CUSTOM-MADE EAR PLUGS

These are individually custom-made to fit the user’s external auditory canal. The auditory canal is sealed by the plug and the acoustic filter determines the required attenuation.

Advantages (compared to disposable and pre-formed)

Maximum wearing comfort – especially for long-term usage, easy to use, secure and stable seal that ensures a high level of protection certainty. A broad range of filters offers the opportunity of attaining the best possible attenuation level, retention of perception of signals and sounds, and, what is more, continuous ventilation of the auditory canal.

Disadvantages

Not immediately available (delivery time), relatively high investment in initial purchase, but will pay in the long run.

