

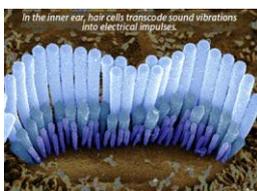
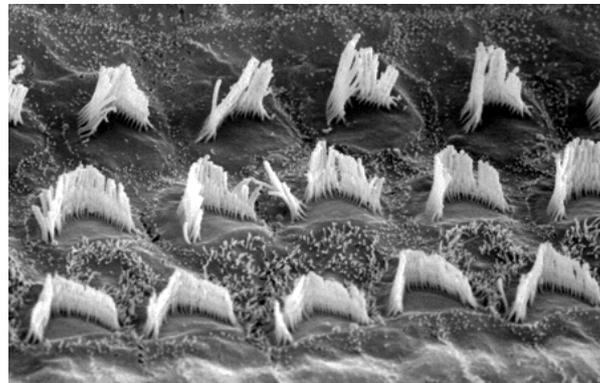
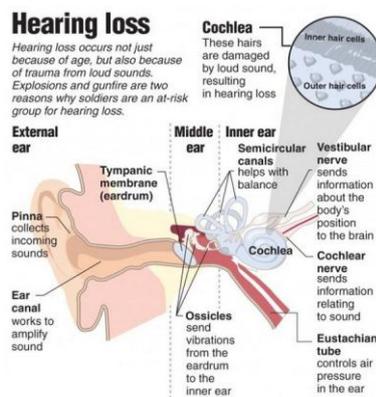
## The Harmful Effects of Noise

Most people will have awareness of just how damaging noise can be, whether it's noise pollution in the environment or excessive noise exposure in the workplace. One thing that many campaigners face is raising noise awareness among the general public. Whilst a majority of people will have heard of hearing-specific conditions such as tinnitus and hearing loss, it is less likely that they understand why noise pollution and exposure to excessive noise levels are so harmful. In this short article, we look at the dangers of excessive noise and noise pollution not only on people but also on the environment.

### How we hear

Sounds enters the head through the ear canal and hits the ear drum which vibrates when the sound waves hit it. Behind the drum in the middle ear cavity are there tiny bones; stirrup, the anvil and the hammer; they vibrate too and actually amplify the sound. They send the amplified sound vibrations to the cochlea which looks sort of like a snail. The sound waves travel around and around inside the cochlea and bend over tiny nerve endings called hair cells, much like wind pushes around a field of grain. These hair cells are the ends of nerve cells and the movement of the hair cells sends electrical signals to the brain. The brain decodes those signals and we hear. So that's how hearing works.

But what happens when an ear is subjected to hazardous noise? If those hair cells get bent over to the point they can't spring back, that's when hearing loss occurs. With a moderately loud sound wave (moderately loud noise), the hair cells bounce back OK. But when the sound is extremely loud (extremely loud noise) the hair cells don't spring back. So extremely loud sounds can cause permanent damage, but so can moderately loud sounds if they continue over an extended period of time.



### Noise pollution, excessive noise and the effect on people

From conditions such as acoustic shock (caused by severe one-off instances of extremely loud noise) to tinnitus (which can be caused by long-term exposure to excessive noise levels), there is a whole range of health conditions that are related to noise, each varying in severity and cause, but most of which can be easily avoided. The inner workings of our ears are incredibly sensitive and delicate, and

are prone to damage if not treated carefully. All noise is caused by vibrations in the air, which are picked up by tiny hairs in our ear canal and then travel to our inner ear. The louder the sound is, the larger the vibration. It doesn't take an acoustics expert to conclude that a large vibration will cause damage to the sensitive components of our ear, which is why loud noises can often be uncomfortable and in some cases, painful. Burst eardrums and conditions like acoustic shock are incredibly painful and can cause lasting damage to someone's hearing, not only affecting their ability to carry out everyday activities, but also their overall quality of life.

### **Hearing loss and noise pollution**

Conditions such as tinnitus and hyperacusis are more prolonged in their development and are caused by constant exposure to excessive noise levels. As with damaged eardrums and acoustic shock, these conditions are as a result of damaged components of the ear, and can be caused by something as mundane as listening to loud music through headphones or listening to cars or motorbikes on a racetrack. As they age, some people struggle with tinnitus, which can be blamed on the years spent listening to rock bands, construction workers not bothering with ear defenders, constantly involved with noisy cars and motorcycles etc. Those who suffer from the condition regret not taking better care of her hearing in their youth. However, these aren't the only audible threats to our hearing. Local authorities in the UK have procedures in place to deal with noise complaints lodged by residents, caused by anything from noisy neighbours to excess noise from nearby industrial sites, nearby racetracks and airfields. It may seem that certain noises are just annoying (e.g. the neighbour's barking dog, loud music, noisy airplanes, racetracks etc.), but being constantly disturbed by nuisance noise can cause serious health conditions.

### **Hearing loss at work**

Noise can not only affect us at home, but it can also affect us in the work place or in public gatherings. Although every workplace is bound by the Control of Noise at Work Regulations 2005, industries such as construction, mining and entertainment (nightclubs, theatres, racetracks and music etc) are the most common places where noise can become an issue. The most common sources of excessive noise levels in these industries are heavy machinery, vehicles and loud music/instruments. It is not always possible to remove these sources from these industries as they are integral to their operation, but there are steps that can be taken to protect hearing, thereby preventing conditions like those discussed earlier. By using the proper tools, organisations can measure and monitor their noise levels and take steps to introduce effective personal protective equipment (PPE), such as ear defenders and earplugs. Just as it's important to wear eye protection, high-vis jackets and hard hats, it's important for all employees to ensure that they wear the correct PPE to protect their hearing and their overall health and wellbeing.

### **Noise and Health**

Noise nuisance can lead to serious conditions, such as cardiovascular disease and heart attacks due to the levels of stress nuisance noise can cause. Reoccurring episodes of sleep loss caused by noise pollution can also lead to mental health conditions such as depression and anxiety. There's also a growing body of opinion that considers that there is a link between hearing loss/noise pollution and Alzheimer's disease. However, it has yet to be confirmed whether this is cause or effect. It's the responsibility of local authorities to investigate and take action on all noise nuisance complaints and where noisy businesses operate close to residential areas, it is their responsibility to monitor their noise levels to ensure that they're not posing a risk to local residents' health.

It is well understood that noise levels below the hearing damaging criterion cause annoyance, sleep disturbance, cognitive impairment, physiological stress reactions, endocrine imbalance, and cardiovascular disorders. Public health policies rely on quantitative risk assessment to set environmental quality standards and to regulate the noise exposure that is generated by

environmental noise sources in the communities. According to the European Environmental Noise Directive (END), member states are currently assessing and documenting the noise exposure from environmental noise sources in their countries, including road, rail, aircraft, racing circuits and industrial noise. With respect to noise mitigation measures, the avoidance and prevention of physical health effects plays an exceptional role in public health, besides other aspects of the quality of life that may be affected by noise. The cardiovascular effects of noise have been the source of growing interest in recent years because there is evidence that noise affects cardiovascular health. High blood pressure and ischemic heart diseases (including myocardial infarction) have a high prevalence in industrialized countries and are a major cause of death. The question at present is no longer whether noise causes cardiovascular effects, it is rather: what is the magnitude of the effect in terms of the exposure-response relationship and the onset or possible threshold of the increase in risk.