

# Ototoxicity

*Simply put, ototoxicity is poisoning of the ear. Ototoxicity occurs due to exposure to chemicals or drugs that damage the inner ear [cochlea] or the vestibulo-cochlear nerve which connects the inner ear to the brain and delivers hearing and balance information.<sup>1</sup> It usually occurs as a side effect of a drug. Ototoxic damage causing hearing loss is generally irreversible.*

## Which drugs can cause ototoxicity?

There are several drugs that can cause ototoxicity. Usually they are prescribed for very serious health conditions despite the possibility of reducing a patient's hearing. These drugs include aminoglycoside antibiotics such as gentamycin, loop diuretics ['water pills'] such as frusemide and platinum-based chemotherapy medications such as cisplatin. Some types of nonsteroidal anti-inflammatory drugs [NSAIDs] in high doses have been shown to be ototoxic.

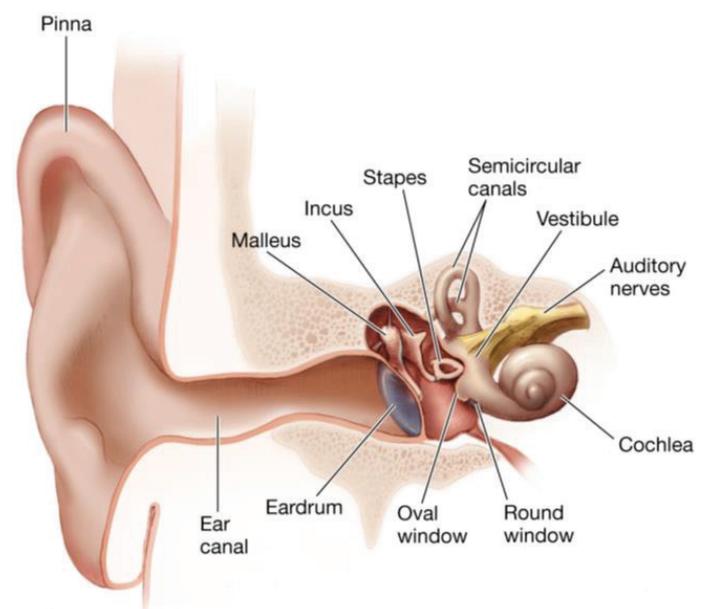
## What type of damage occurs?

The hair cells within the inner ear, and the vestibule-cochlear nerve can be impaired through ototoxicity.

When damage occurs to these structures, any degree and combination of hearing loss and/or balance disruption are possible depending upon the affected part[s].<sup>1</sup>

Hair cells are found in both the cochlea and vestibular sections of the inner ear. They are composed of a cell body with a hair-like

attachment. These 'hairs' generally bend in response to sound vibrations or movement, from which point they send electrical signals to the brain about hearing or balance function. Ototoxicity can impair these hair cells to the extent that they no longer 'stand-up', hence, reducing hearing sensitivity and the auditory and/or balance signals that are sent to the brain.<sup>1</sup>



Parts of the ear<sup>2</sup>

## What are the signs and symptoms?

Ototoxicity typically occurs when the inner ear is poisoned by medication which damages the cochlea, vestibule, semi circular canals, or the auditory nerve. As a result of damage to one or more of these structures, a patient may experience hearing loss, imbalance or vertigo, and tinnitus.

A patient may also experience any of the following:

- A higher risk of falls due to balance issues
- A loss of hearing which has been linked to cognitive decline and risk of dementia
- Psychological effects, such as depression, isolation, anxiety, anger, self-esteem issues
- Broader economic impacts, such as a higher rate of unemployment, difficulty in attaining employment and advancing a career

## How is it diagnosed?

Ototoxicity is generally identified via a hearing assessment with an audiologist. The audiologist will perform various hearing assessments in order to make a broad diagnosis of hearing loss.

With these results, an Ear Nose and Throat [ENT] specialist will generally look at a range of other factors which may include a person's medical history, the medications they are taking, and the symptoms they are reporting before diagnosing ototoxicity as a cause of a person's hearing loss. The ENT may also request a series of longer electrophysiological assessments which will provide them with a more in-depth analysis of the various structures involved in the hearing process.

## What are the treatment options?

Currently, there are no medical treatments to reverse the damage. Rather, available treatments aim to minimise the effects of the damage and rehabilitate function.<sup>1</sup> Withdrawal of the ototoxic medication may be advised when the risks of doing so are less severe than the hearing loss or associated symptoms caused by ototoxicity. In other words, if the person is healthy enough to be taken off the medication, they will be.

It is important to consider possible alternate drugs that do not have the risk of hearing loss or tinnitus, when there is unilateral hearing loss already present.

Hearing aids, however, may be a successful option in treating a hearing loss caused by ototoxicity, and it is worth consulting with an audiologist about the best form of treatment in this regard.

## Who to contact?

- Your GP
- Audiologist
- ENT specialist

## References

1. Haybach, PJ. Ototoxicity [Internet]. Portland: Vestibular Disorders Association; 2002 [cited 2017 Dec 13]. Available from: <http://vestibular.org/ototoxicity>
2. PubMed Health. Ear. [Image on internet] [cited 2017 Dec 13]. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/health/PMHT0024836/>