



## Ototoxins

Ototoxic agents are either man made or naturally occurring substances and chemicals known to damage the ear. The study of Ototoxins is relatively new. Promising research is ongoing in an effort to explain how ototoxins damage the human ear and what can be done to eliminate or minimize risk of hearing loss as result of exposure.

Ototoxic agents are in forms of heavy metals, solvents, asphyxiant gases, medications, and certain mother-in-laws.

In the early to mid 1900s, many **Aminoglycoside** anti-biotics were developed to fight infection. These high-powered drugs saved many lives; it was unknown, however, that these new anti-biotics were causing significant hearing loss. Aminoglycoside anti-biotics are still used today in extreme cases. Most current day anti-biotics leave the auditory mechanism in tact. Known ototoxic anti-biotics are:

- Amikacin
- Streptomycin
- Neomycin
- Gentamicin
- Ribostamycin
- Kanamycin
- Tobramycin
- Netilmicin
- Dihydrostreptomycin

Life-saving medical procedures most always take precedence over potential ill side effects. Advances in cancer treatment have developed **Anti-Neoplastics**. A major anti-cancer drug responsible for hearing loss is Cisplatin. Cisplatin is still commonly utilized in high doses to treat highly difficult forms of cancer such as Ovarian and Bladder cancer. Known ototoxic anti-Neoplastics include:

- Cisplatin
- Bleomycin
- Vincristine
- Nitrogen Mustard
- Vinblastine

**Diuretics** are well represented in the family of ototoxins. Hearing loss due the ingestion of diuretics is often reversible. However, the use of diuretics in conjunction with aminoglycoside anti-biotics will permanently damage the aural mechanism. Known ototoxic diuretics include:

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1781 S. Bell School Rd. | Cherry Valley, IL 61016

Phone: 815.332.3460 | Fax: 815.332.5175

Company Website: <http://www.tkontheweb.com>



- Furosemide (Lasix)
- Bumetanide (Bumex)
- Torsemide (Demadex)
- Ethacrynic Acid (Edecrin)
- Acetazolamide
- Mannitol

**Quinines** (drugs used to treatment Malaria and similar diseases) are documented ototoxins. Known ototoxic quinines include:

- Quinidine
- Chloroquine
- Tonic water

Many **Environmental Chemicals** used today in industry are known ototoxins. The full effect upon the aural mechanism resulting from either heavy or casual exposure to these agents is under investigation. Of great interest is the combined effect of environmental ototoxic chemicals and noise exposure. Research studies using laboratory animals are showing that the interaction of noise combined with ototoxic drugs and/or environmental agents is significantly damaging.

Many industrial solvents are ototoxic. Solvents damage the aural mechanism by affecting the either the hair cells within the cochlea directly, or by affecting the ear associated neural pathways of the central nervous system.

Toluene (used as thinners and degreasers) is commonly used in today's industry. Carbon Disulfide is another ototoxin commonly seen in the textile industry.

Known environmental chemicals and solvents include:

- Trichloroethylene
- Xylene
- Styrene
- Butl Nitrate
- Toluene
- Hexane
- Carbon Disulfide
- Mercury
- Manganese
- Tin
- Lead



- Carbon Monoxide

Finally, **Aspirin** is a known Ototoxin. Individuals with Arthritis often heavily use aspirin. Hearing loss caused by the ingestion of aspirin is reversible when ingestion of the substance is ceased.

The presence of potential ototoxic interactions underlines the importance of obtaining a complete aural case history when performing industrial audiometry. Knowledge of significant past ototoxin exposure may certainly be useful information when evaluating occupational hearing loss.

Research may in the future allow the development of tests to evaluate hearing losses attributable to ototoxic exposure. It is most probable that any hearing loss due truly to ototoxic exposure in industry is due to chronic long- term exposure-not one or two time exposure.

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Authored by: Robert Williams, Au.D. | Director Audiology | T K Group, Inc.