

The Stanford Initiative to Cure Hearing Loss is investigating how the ototoxic antibiotic gentamicin gets into sensory hair cells in the inner ear and causes their death. Their findings may one day lead to the development of treatments which can protect the ear from damage while people are being treated with these medications.¹

In the meantime, here is a review of current clinical practices related to ototoxic medications.

The Audiological Impact of Ototoxic Drugs

Overview of Ototoxic Medications

According to the American Speech-Language-Hearing Association (ASHA), there are more than 200 known ototoxic medications, both prescription and over-the-counter, on the market today.³ While these medications may be prescribed to treat everything from serious infections to heart disease to life-threatening cancers, in some cases, they also have been documented to cause damage to the structures of the inner ear, including the cochlea and vestibular system. Damage to these structures may result in hearing loss, tinnitus and/or dizziness/imbalance.²

Ototoxic Monitoring

Though not always possible, ototoxicity can be prevented or minimized when a patient is monitored for this complication. A baseline hearing evaluation prior to the patient receiving the drug therapy is recommended. This is especially important in patients undergoing chemotherapy, including the drug cisplatin, or carboplatin, which has been documented to cause marked hearing loss after just one dose.⁵ In some cases, a different drug may reduce the risks of ototoxicity.

When it is not possible to prescribe a different drug, a consultation with an audiologist may help the patient understand the audiological side effects of a particular drug, as well as the steps necessary to manage any resulting hearing loss, tinnitus or vestibular disorders. Currently, there is no treatment to reverse the damage caused by ototoxic drugs, but amplification may improve the patient's hearing and quality of life.²

The risk of ototoxicity increases if the patient is taking one or more potentially ototoxic drugs, or if the patient is exposed to loud noises while undergoing treatment with an ototoxic medication.⁵



Ototoxic Symptoms

A patient being treated with a potentially ototoxic medication may experience symptoms after taking just one dose of the drug, several, or even months after treatment is completed. Typically though, symptoms develop quickly and may include:

- Tinnitus (ringing in the ears)
- Hearing loss
- Disequilibrium or dizziness

If a patient presents with symptoms related to hearing loss, a comprehensive audiological evaluation can determine the degree and symmetry of hearing loss. Careful ototoxic monitoring can assist in preventing further damage to the patient's hearing, or if necessary, may allow the patient to work with the audiologist to develop a plan for treatment/amplification.⁵

It is also suggested in the literature that vestibular function be monitored during treatment with ototoxic medications.

Ototoxic Medications

Here is a brief overview of the drugs most commonly associated with ototoxicity. This list represents current clinical practice guidelines from the American Academy of Audiology.⁵

- **Aminoglycosides:** Examples of aminoglycosides include:

dihydrostreptomycin, tobramycin, kanamycin, amikacin, and gentamicin. These medicines are usually only ototoxic when delivered intravenously.

- **Loop diuretics:** The most common ototoxic loop diuretics are bumetanide (Bumex), furosemide (Lasix), and ethacrynic acid (Edecrin). These medicines may be ototoxic when given intravenously for acute kidney failure, acute hypertensive crisis, or acute pulmonary edema/congestive heart failure.
- **Nonsteroidal anti-inflammatory drugs (NSAID):** These medicines include acetylsalicylic acid (aspirin) or salicylates, ibuprofen and naproxen, among others. Higher doses have been documented to cause ototoxicity which is almost always reversible once the medication is discontinued.
- **Platinum coordination complexes:** Though these medications are highly effective at treating a variety of solid tumors, they have been proven to cause ototoxicity. Examples of these compounds include cisplatin, carboplatin, oxiloplatin, nedaplatin, ZD0473, BBR3464, and satraplatin. Cisplatin is the most widely used and most ototoxic drug in clinical use today and its impact can be minimized by careful monitoring.

- **Quinine:** Examples of these medicines include chloroquine phosphate (Aralen), quinacrine hydrochloride (Atabrine) and quinine sulfate (Quinam). The ototoxic effects are very similar to those of aspirin.⁴

This is not a complete list of drugs that can affect a patient's hearing and balance, and in no way reflects a recommendation by the author as it relates to prescribing these medications.

For more information regarding ototoxicity, visit the **Associated Audiologists** web site at www.hearingyourbest.com and select **Physicians' Resources**. There, you can view a **comprehensive list of ototoxic medications from the League of Hard of Hearing, and clinical practice recommendations from the American Academy of Audiology.**

Other Considerations

Ototoxic drugs generally are not administered alone and may well interact with one another or with the disease process under treatment.

It is not always possible to anticipate or manage ototoxicity due to the need for emergent or life-saving care, but when possible, a baseline hearing evaluation can be helpful in anticipating the patient's risk for ototoxicity and managing any resulting hearing loss.

By Tim Steele, Ph.D., FAAA, CCC-A. Dr. Steele is the president of Associated Audiologists, Inc. and has allied health staff privileges at Saint Luke's South and Shawnee Mission Medical Center. He is also a clinical assistant professor and has an ad hoc graduate faculty appointment at the University of Kansas Medical Center, where he teaches audiology coursework. Dr. Steele also provides clinical supervision for regional audiology training programs.

References:

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- 2 Medscape, Ototoxicity, by Pamela A Mudd, MD, Resident Physician, Department of Otolaryngology, University of Colorado Health Science Center, May 7, 2012.
- 3 Ototoxic Medications, Audiology Information Series, American Speech-Language-Hearing Association, 2011.
- 4 Ototoxic Medications, Drugs that Can Cause Hearing Loss and Tinnitus, League for the Hard of Hearing, 2000.
- 5 American Academy of Audiology Position Statement and Clinical Practice Guidelines, Ototoxicity Monitoring, Oct. 2009.

Tim Steele, Ph.D., FAAA, president; Jim Wise, Ph.D., FAAA, president-emeritus; Stacey Baldwin, Au.D., FAAA; Sam Bittel, Au.D., FAAA; Laura Flowers, Au.D., FAAA; Dave Nissen, Au.D., FAAA; Traci Ring, Au.D., FAAA; Larry Ruder, M.A., FAAA; Erica Smith, Au.D., FAAA; Dana Jacobson, Au.D., FAAA; Samuel A. Gillespie, Au.D., FAAA; Tammy Gonzales, Au.D., FAAA; Susan Smittkamp, Au.D., Ph.D., FAAA; and Linda Erickson, M.A., FAAA

ASSOCIATED AUDIOLOGISTS, INC.

Overland Park
Southridge
Medical Building
913-498-2827

Prairie Village
Prairie Village
Office Center
913-262-5855

Shawnee Mission
Antioch Hills
Medical Building
913-403-0018

Leavenworth
Cushing
Medical Plaza
913-682-1870

Manhattan
Manhattan
Medical Center
785-539-7361