OTOTOXICITY

Identifying and managing risks from ototoxic exposures in the workplace

This graphic summary has been produced by the International Ototoxicity Management Group (IOMG). Please refer to the companion 2025 manuscript Approaches to managing ototoxicity in the workplace.

It is intended to inform the health management of those exposed to chemicals that pose a risk to hearing and balance functions. This information applies to chemical exposures of any level, **with or without** noise exposures.

What chemicals can damage balance and hearing?

Exposure to certain chemicals can damage different parts of the ear. Effects include balance and/or hearing difficulties. These hazards are called **ototoxic.** Examples include solvents, degreasers, fuels, mercury, lead, carbon monoxide, and pesticides. Their effects can be prevented. Current hearing monitoring (pure-tone audiometry alone) in occupational health is however insufficient to detect and prevent ototoxicity from chemical exposures.

To find out if chemicals in your workplace may damage hearing or balance go to the Safety and Health Informational Bulletin **Preventing Hearing Loss Caused by Chemical and Noise Exposure.** (OSHA, NIOSH 2018) and the cited literature on page 3.

What are benefits and harms of managing ototoxicity?

Benefits:

- Assessing possible exposure pathways to ototoxic chemicals
- Reducing injury risk by addressing impaired hearing and or balance functions
- Improving effectiveness of safety and health efforts
- Preventing further effects

Harms:

- Possibility of distress by workers during monitoring
- Possibility that getting a referral may be inconvenient and burdensome

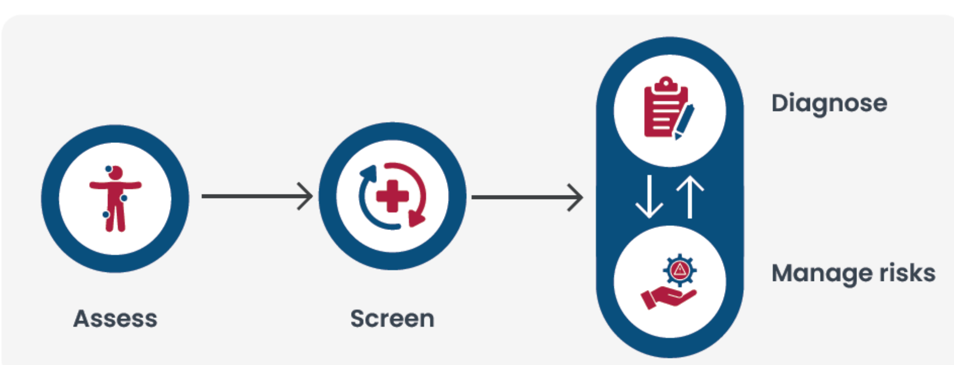
Benefits of identifying those at risk

- ✔ Harm to workers may be prevented
- ✔ Workers will have the option for earlier treatments

Harms of monitoring

- ✔ Workers or employers or occupational health professionals may feel burdened by this process

What are the steps for ototoxicity management?



Step 1 Are workers at risk?

General information about the potential health and safety hazards of materials used in various industries can be found in **Safety Data Sheets.** See references on page 3 and in the IOMG companion document.

Step 2 How to screen workers?

- Hearing testing to complement pure-tone audiometry
- Vestibular screening
- Use validated instruments to obtain self-reports of listening difficulties and vestibular functions.

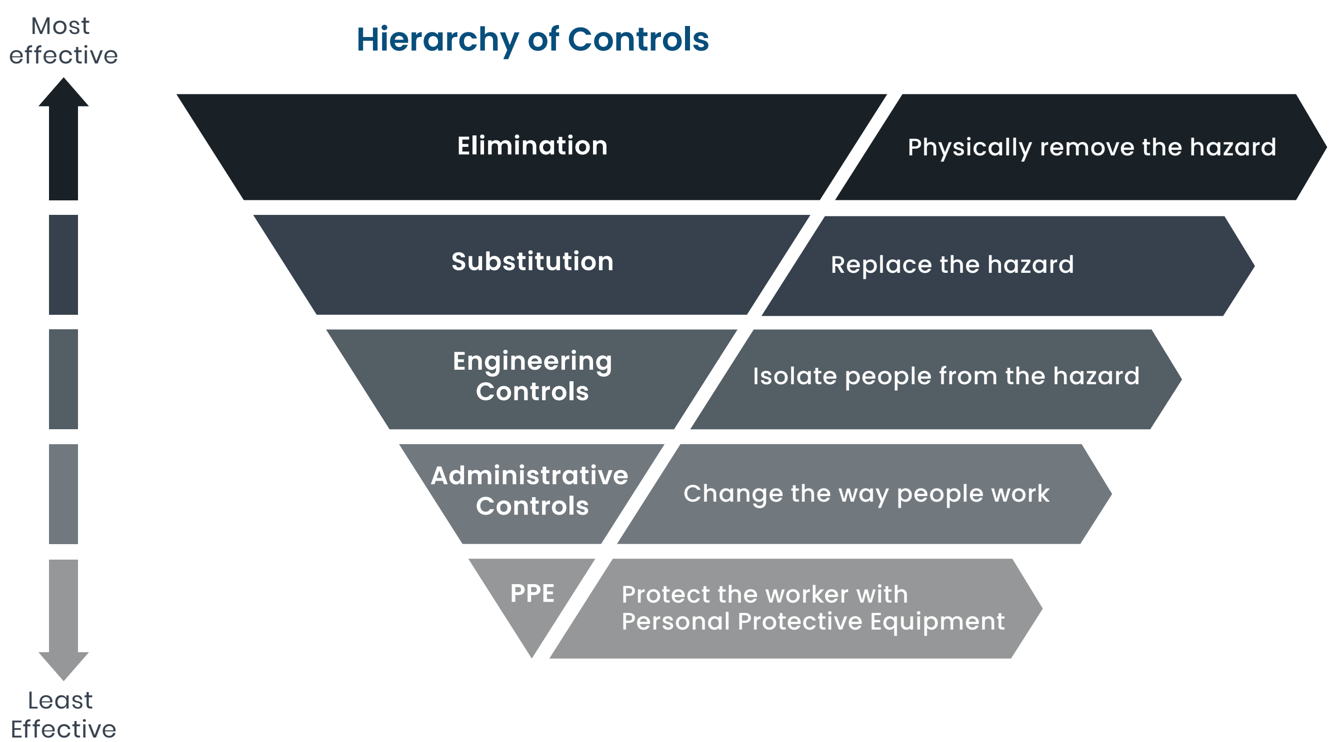
Listening and balance difficulties signal a need for further testing. Screening both listening and vestibular functions provides an evaluation of how well the different parts of the auditory system work together to detect, process, and understand sound and control balance.

Screening results and questionnaire responses will help occupational health and safety program professionals (occupational physician, otolaryngologist, or audiologist) determine if a referral for further testing is necessary. Referrals must include both past noise and chemical exposures as well as screening results.

See Flowcharts on pages 4 and 5.
For information on alternatives of tests and self-report instruments see IOMG companion documents.

Step 3 What are other steps for ototoxicity management?

Use the hierarchy of controls to find the most effective actions to take. Responsibility for healthy hearing is shared by both the company and workers.



Minimizing chemical exposures can protect hearing and balance

Managers and Health and Safety Professionals:

- Identify, measure, and control ototoxic exposures in the workplace
- Communicate with workers: risks and preventive actions
- Label areas of hazardous exposures clearly
- Buy quiet/safe equipment when possible
- Invest in providing a wide variety of safety gear for different body shapes
- Train workers to correctly wear personal protective equipment (PPE)
- Fit-test PPE to assure workers are properly protected
- Ensure that spaces where employees take breaks are quiet and safe

Workers:

- Bring occupational exposures to chemicals to management's attention
- Identify and control ototoxic exposures (and noise exposures) at home
- Consistently use Personal Protective Equipment that is appropriate for the exposure and fit-tested (in the case of respiratory and hearing protection).
- Handwash carefully after handling chemicals
- Keep the volume for personal listening devices at a safe level
- Urgently get any hearing problems or ringing checked out by a medical professional

Resources

ATSDR, Agency for Toxic Substances and Disease Registry. Toxicological Profiles. 2023. https://www.atsdr.cdc.gov/

ACGIH, American Conference of Governmental Industrial Hygienists. TLVs and BEIs. 2024. Based on the documentation of the threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists. https://www.acgih.org/science/tlv-bei-guidelines/

CCOHS, Canadian Centre for Occupational Health and Safety. 2023. Occupational Hygiene- Ototoxic Chemicals. https://www.ccohs.ca/oshanswers/hsprograms/occ_hygiene/occ_ototoxic_chemicals.html

The Nordic Expert Group for Criteria Documentation of Health Risks from Chemicals. Johnson AC, Morata TC. Occupational exposure to chemicals and hearing impairment. Arb o Hälsa 2010; 44, 1-177142. https://gupea.ub.gu.se/handle/2077/23240

OSHA- Recommended practices for safety and health programs. Occupational Safety and Health Administration. https://www.osha.gov/safety-management/step-by-step-guide

OSHA-NIOSH 2018. Preventing Hearing Loss Caused by Chemical (Ototoxicity) and Noise Exposure Safety and Health Information Bulletin (SHIB), Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health. SHIB 03-08-2018. DHHS (NIOSH) Publication No. 2018-124. https://doi.org/10.26616/NIOSHPUB2018124

For more detailed information on workplace ototoxicity management programs, please refer to the companion document by the International Ototoxicity Mangement Group (IOMG).

Access and share: https://en.wikiversity.org/wiki/International_Ototoxicity_Management_Group_(IOMG)

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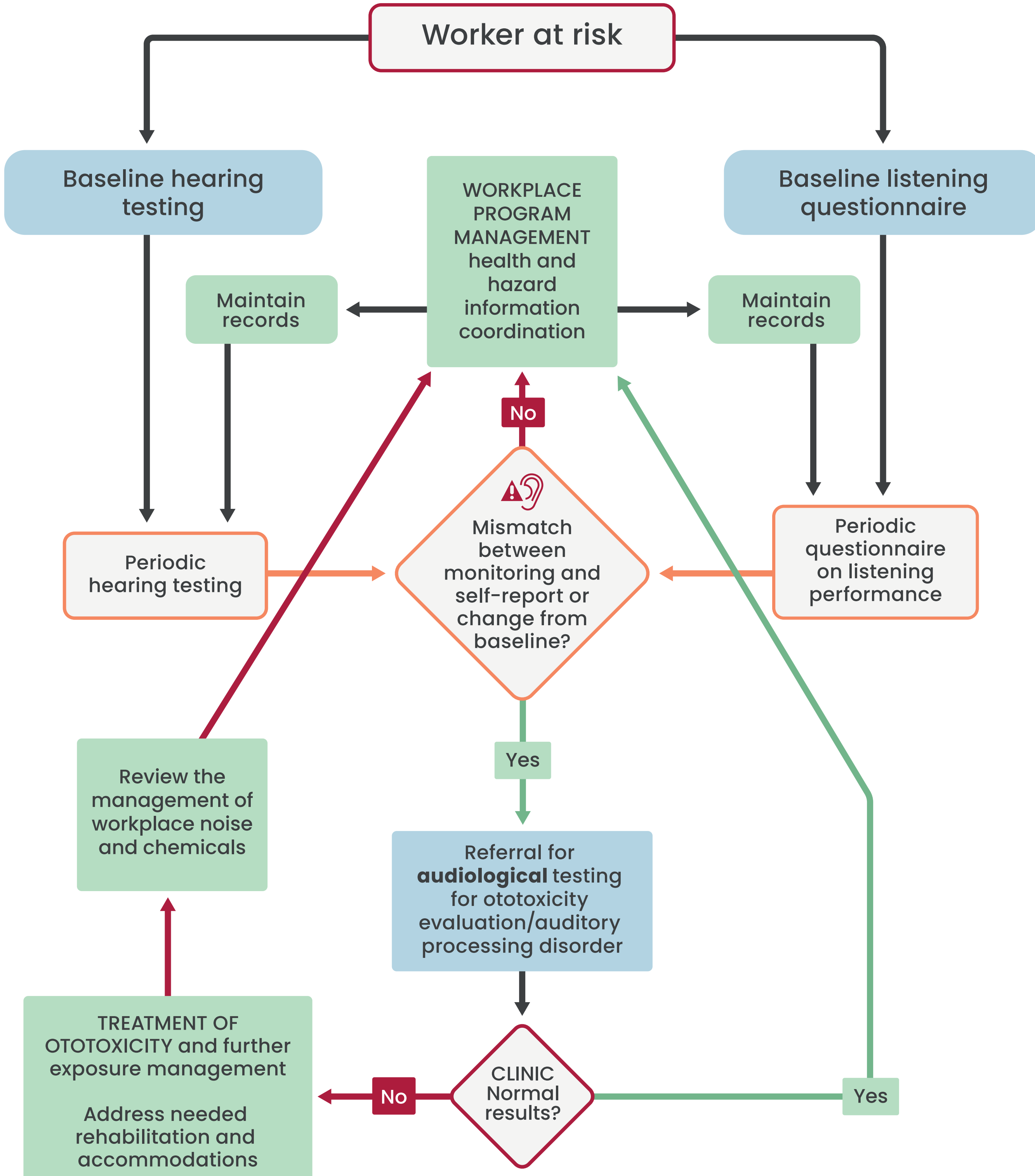

Identifying and managing balance risks from ototoxic chemicals