



Just the Facts... Occupational Ototoxins (Ear Poisons) and Hearing Loss

The Problem

Exposure to certain chemicals, either alone or in concert with noise, may result in hearing loss.

Inhalation exposure to some chemicals may cause hearing loss, independent of noise exposure, while some chemicals may not cause hearing loss, independently, but may potentiate noise-induced hearing loss. Inhalation exposure to some chemicals may have additive or synergistic effects with noise exposure. Certain chemical substances have shown ototoxic effects at high airborne exposure levels but may not be ototoxic in the concentrations observed in typical occupational settings. Some potential ototoxin chemicals (e.g., toluene, xylene, n-hexane, organic tin, carbon disulfide, mercury, organic lead, hydrogen cyanide, diesel fuel, kerosene fuel, jet fuel, JP-8 fuel, organophosphate pesticides, chemical warfare nerve agents) may be absorbed through the skin, and may significantly contribute to the systemic dose if dermal exposures are not properly controlled.

Since the exposure threshold for such ototoxic effects is generally not known, audiometric monitoring is necessary to know if the substance is affecting the hearing of exposed workers. While audiometric data are useful for any worker exposed

to any measurable level of a potential ototoxic chemical, yearly audiograms are highly recommended for workers whose airborne exposures (without regard to respiratory protection worn) are at 50% or more of the Occupational Exposure Limit (more stringent of the Occupational Safety and Health Administration Permissible Exposure Limit or American Conference of Industrial Hygienist Threshold Limit Value) for the substance in question, regardless of the noise level. The 50%, while somewhat arbitrary, will ensure the collection of data from sub-Occupational Exposure Limit exposures. If there are dermal exposures to toluene, xylene, n-hexane, organic tin, carbon disulfide, mercury, organic lead, hydrogen cyanide, diesel fuel, kerosene fuel, jet fuel, JP-8 fuel, organophosphate pesticides, or chemical warfare nerve agents, and such exposures may result in a systemic dose equivalent to 50% or more of the Occupational Exposure Limit, yearly audiograms are also recommended.

If a worker is currently participating in a hearing conservation program due to excessive noise, the reviewers of the audiometric data should be alert to possible additive, potentiating, or synergistic effects between the exposure to noise and the chemical substance and, if necessary, suggest reducing the exposure to one or both.

Table. Potential Ototoxic Chemicals in the Occupational Environment.

Hazard name	Count of U.S. Army Worksite Occurrences	Count of U.S. Army Installations Representative in Worksite Counts
Fuels	9055	575
Carbon monoxide	9393	316
Lead and derivatives	5950	418
Toluene	4904	256
Xylene	4000	254
Stoddard solvent	3331	227
Mercury and derivatives	879	130
Organophosphate pesticides	598	166
Chemical warfare nerve agent	1149	67
Perchloroethylene	604	92
n-hexane	577	80
Ethyl benzene	537	84
Trichloroethylene	294	92
Manganese	299	69
Styrene, monomer	321	58
Cyanide	195	53
Organic tin	199	46
Arsenic	107	78
Carbon disulfide	23	13
Paraquat	20	8

Activities Where Noise and Ototoxins Often Combine

- Painting
- Printing
- Boat building
- Construction
- Furniture making
- Manufacturing of metal, leather and petroleum products
- Fueling vehicles and aircraft
- Firefighters
- Weapons firing

Documentation

Enter nature and level of the ototoxin in the comment sections of the DD 2215, Reference Audiogram and DD 2216, Hearing Conservation Data.

Further Reading

Morata T.C., Chemical Exposure as a Risk Factor for Hearing Loss, JOEM, Vol. 45, Number 7, July 2003.

<http://www.cdc.gov/niosh/topics/noise/whatsnew/noiseandchem/noiseandchem.html>