

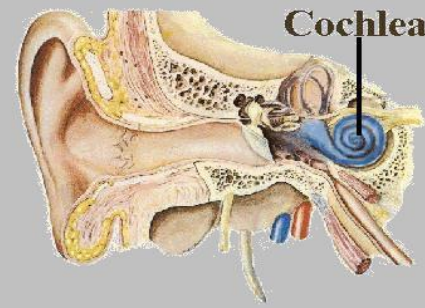
Occupational Noise Exposure

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Noise Induced Hearing Loss



- > one million adults across the country reported having a hearing-related disability, a number more than 50% greater than the number of people reporting problems with their eyesight (StatsCan, 2002).
- True number may be >three million Canadian adults
- US National Health and Nutrition Survey revealed that noise is the number one cause of impaired hearing (CDC/NCHS, 2002)
- It is permanent and irreversible
- 2006 Australian study estimated that costs to that nation's economy from hearing loss amounted to CAD\$10.6 billion per year.
- On a per capita basis, this could mean a Canadian equivalent of almost \$18-billion per year

Occupational Noise Regulation

- Based on employee noise exposure
- Noise Control Required
 - » Hearing protection a last resort
- $L_{eq} < 85$ dBA (3 dB/doubling)
- (ACGIH, EPA, BC, Federal, most provinces)
- $L_{OSHA} < 90$ dBA, i.e. 5 dB/doubling (US, Quebec)

Table 3-1. Estimated excess risk of incurring material hearing impairment* as a function of average daily noise exposure over a 40-year working lifetime†

Reporting organization	Average daily noise exposure (dBA)	Excess risk (%) ²
ISO	90	21
	85	10
	80	0
EPA	90	22
	85	12
	80	5
NIOSH	90	29
	85	15
	80	3

*For purposes of comparison in this table, material hearing impairment is defined as an average of the HTLs for both ears at 500, 1000, and 2000 Hz that exceeds 25 dB.

†Adapted from 39 Fed. Reg. 43802 [1974b].

²Percentage with material hearing impairment in an occupational-noise-exposed population after subtracting the percentage who would normally incur such impairment from other causes in an unexposed population.

from NIOSH Occupational Noise Exposure Revised Criteria 1998

Occupational Noise Limits in Canada

from CCOHS.ca

Jurisdiction (federal, provincial, territorial)	Continuous Noise		Impulse / Impact Noise	
	Maximum Permitted Exposure Level for 8 Hours: dB(A)	Exchange Rate dB(A)	Maximum Peak Pressure Level dB(peak)	Maximum Number of Impacts
Canada (Federal)	87	3	-	-
British Columbia	85	3	135 dB(A)	-
Alberta	85	3	140	-
Saskatchewan	85	3	-	-
Manitoba	85	3	-	-
Ontario	85	3	-	-
Quebec	90	5	140	100
New Brunswick	85	3	140	100
Nova Scotia	85	3	140	100
Prince Edward Is.	85	3	140	-
Newfoundland	85	3	-	-
NWT/Nunavut	85	5	140	140
Yukon Territories	85	3	140	90

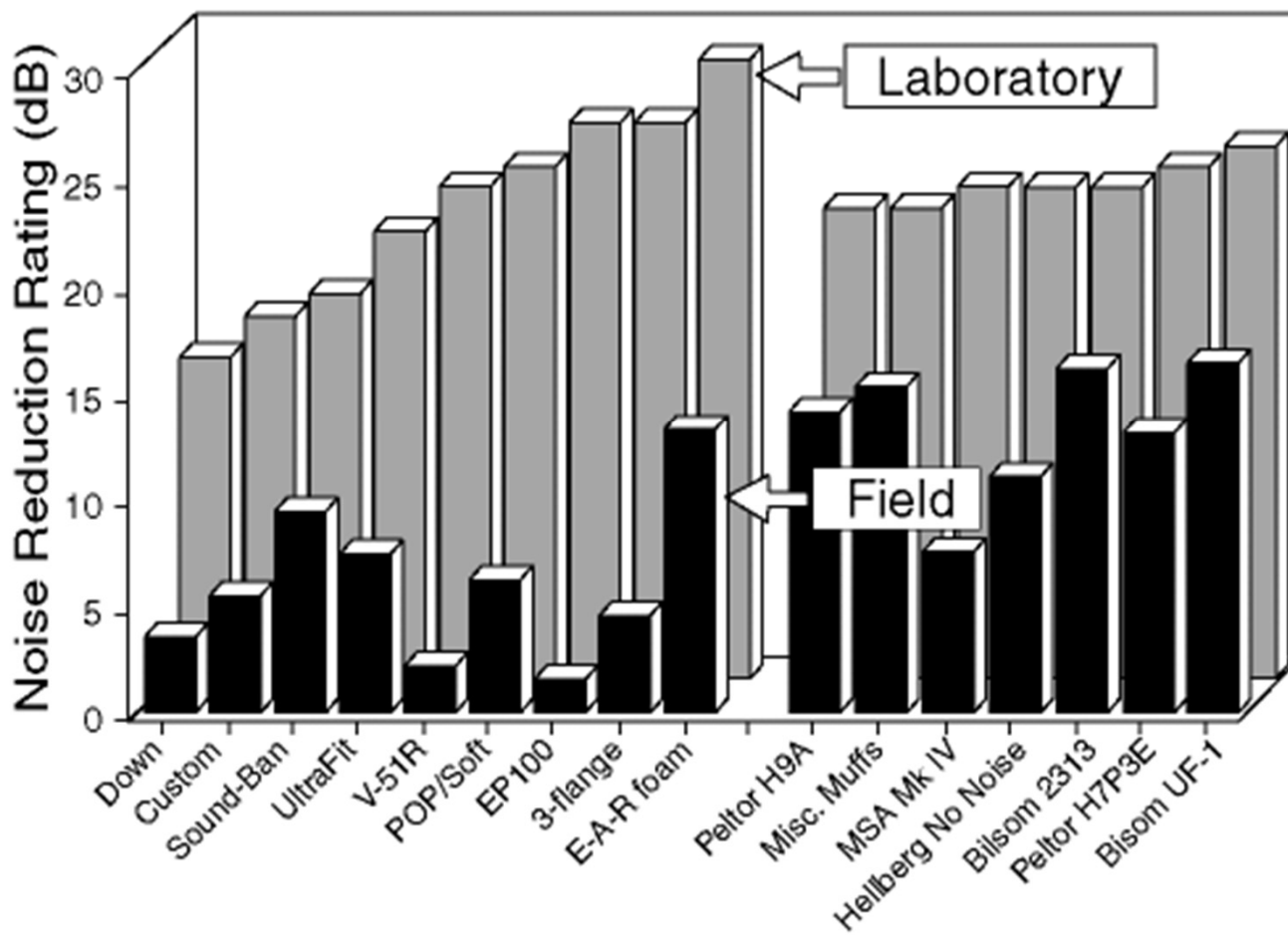
Hearing Protection



Lab vs Field NRR

from EAR EARLOG Series www.peltor.com

Figure 1 - Comparison of NRRs published in North America (labeled values based upon laboratory tests), to real-world "field" attenuation results derived from 20 separate studies.



Ontario Noise Regulation Revisions 2007

- (3) Every employer shall take all measures reasonably necessary in the circumstances to protect workers from exposure to hazardous sound levels. O. Reg. 565/06, s. 2.
- (4) The protective measures shall include the provision and use of engineering controls, work practices and, subject to subsection (7), personal protective equipment. O. Reg. 565/06, s. 2.

(5) Any measurement of sound levels in the workplace that is done in order to determine what protective measures are appropriate shall be done without regard to any use of personal protective equipment. O. Reg. 565/06, s. 2.

(6) Without limiting the generality of subsections (3) and (4), every employer shall ensure that no worker is exposed to a sound level greater than an equivalent sound exposure level of 85 dBA, $L_{ex,8}$. O. Reg. 565/06, s. 2.

(7) Except in the circumstances set out in subsections (8) and (9), the employer shall protect workers from exposure to a sound level greater than the limit described in subsection (6) without requiring them to use and wear personal protective equipment. O. Reg. 565/06, s. 2.

- (8) If this subsection applies, workers shall wear and use personal protective equipment appropriate in the circumstances to protect them from exposure to a sound level greater than the limit described in subsection (6).
O. Reg. 565/06, s. 2.
- (9) Subsection (8) applies if engineering controls are required by subsections (3) and (4) and,

- (a) are not in existence or are not obtainable;
- (b) are not reasonable or not practical to adopt, install or provide because of the duration or frequency of the exposures or because of the nature of the process, operation or work;
- (c) are rendered ineffective because of a temporary breakdown of such controls; or
- (d) are ineffective to prevent, control or limit exposure because of an emergency. O. Reg. 565/06, s. 2.

- (10) A clearly visible warning sign shall be posted at every approach to an area in the workplace where the sound level, measured as described in subsection (5), regularly exceeds 85 dBA. O. Reg. 565/06, s. 2.

CAN/CSA-Z107.56-M86

Canadian Standards

Association Procedures for the Measurement of Occupational Noise Exposure



Longer Shifts (3 dB exchange rate)

- $L_{ex} = 8h L_{eq} + 10 \log (\text{shift length} / 8h)$
- $L_{ex} = 85 + 10 \log (12/8)$
- $L_{ex} = 85 + 2 = 87 \text{ dBA}$

To meet 85 dBA $L_{ex,8h}$ limit of 85 dBA

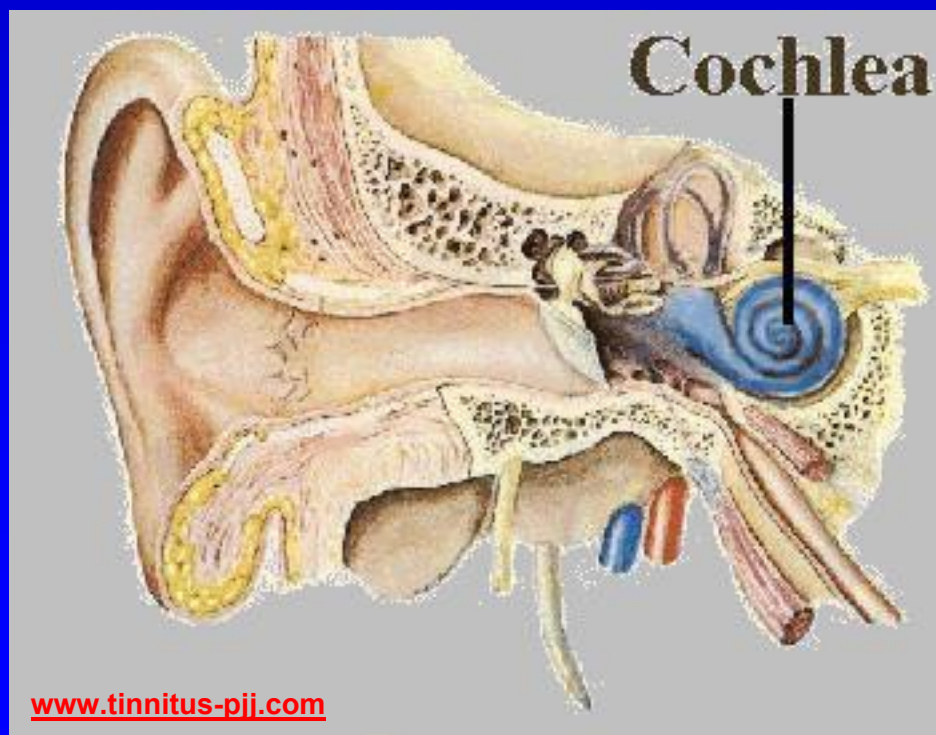
- Requires 8h at 85 dBA
- or 12h at 83 dBA

For 5 dB exchange rate

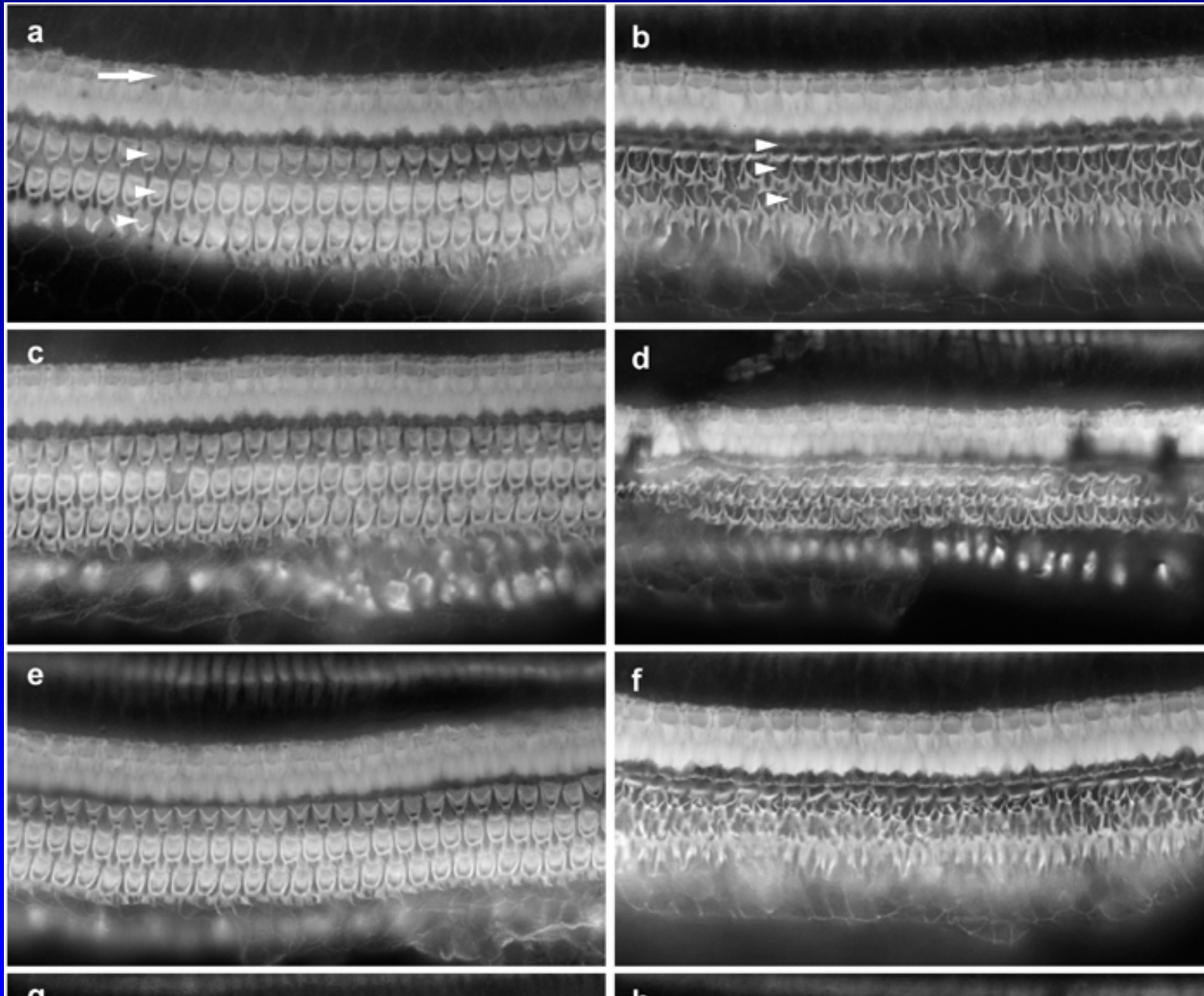
Replace 10 log with 16.61 log

Research on Noise Induced Hearing Loss

- Overstimulation of inner ear generates reactive oxygen species (ROS) which attack sensory cells in the cochlea. ROS reduce antioxidant glutathione causing damage.



Hearing Loss Prevention by Antioxidants



Hearing Pill

- US Navy study and animal tests indicate a commonly available nutritional supplement: N-acetylcysteine or NAC may reduce hearing loss
- Hearing Protection still recommended



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