



Explore the World of Hearing Loss Prevention

35th Annual Hearing Conservation Conference



Saturday, February 27, 2010 NHCA 2010 Conference - Presentation Descriptions

8:40 a.m. – 9:00 a.m.

"Evaluation of the increased accident risk from workplace noise"

Esko Toppila - Finnish Institute of Occupational Health

Ilmari Pyykko – University of Tampere

Rauno Paakkonen - Finnish Institute of Occupational Health

Noise increases accident risk because it reduces speech intelligibility, the ability to hear warning signals, and detection of the direction from which sound is coming. Hearing protectors and hearing loss can exacerbate these effects of noise. To reduce accident risk, occupational industrial hygienists need to identify worksites where the above-mentioned factors may cause accidents. Speech intelligibility can be evaluated using, for example, ANSI standard S3.5-1997, which takes into account the hearing loss and the effect of hearing protectors. For warning signals, ISO standard 7731:2003 can be used; but the effect of hearing protectors must also be evaluated. Occupational health personnel can identify workers susceptible to accident risk by using a standardized questionnaire which identifies the reduced detection of sound direction and speech intelligibility. Also, the audiometric results are needed by the occupational hygienists. The paper gives some applications of accident prevention.

9:00 a.m. – 9:20 a.m.

"Tools for optimizing the installation of warning sounds in noisy places"

Chantal LaRoche - Hearing Research Laboratory, Univ. of Ottawa

Christian Giguere – Hearing Research Laboratory, University of Ottawa

Rida Al Osman – TBA

Yun Zheng - TBA

Warning sounds are necessary to promptly alert workers of events that can compromise safety in the workplace. Unfortunately, the use of warning signals in industry is often submitted to intuitive installation practices with little regard to the many factors contributing to an efficient and safe use. Factors affecting the audibility of warning sounds include the noise field, the hearing status of the workers, the use of hearing protectors, and the acoustical properties of the work room or plant. Proper analysis of all interacting factors is difficult without detailed models and computerized tools. A general modeling framework is proposed to deal with the psychoacoustical and acoustical constraints of the work area. An implementation using two integrated modeling tools, "Detectsound" and "AlarmLocator", is described. The output from these tools offers a solution that can be easily applied in the field (number of warning devices, optimal location on walls, and sound power level specifications).

9:20 a.m. – 9:40 a.m.

"Hearing loss in construction industry: comparisons to ISO-1999 predictions"

Monique Leensen – M.C.J. Leensen, Msc Clinical and Experimental Audiology, Academic Medical Centre (AMC)

J.C. van Duivenbooden, Clinical and Experimental Audiology, ENT department Academic Medical Centre (AMC)

Occupational noise-induced hearing loss (NIHL) in Dutch construction industry is examined by retrospective analyses of 29,644 audiograms of construction employees. Noise-exposed workers had greater hearing losses compared to their non-noise exposed colleagues and to the reference population reported in ISO-1999. Noise exposure level estimates could only explain a small proportion of hearing loss. Our results showed only minor increase in hearing loss when the daily noise exposure level raised from 80 dB(A) towards 96 dB(A). Duration of noise exposure was a better predictor than noise

exposure levels. This relation of duration and hearing loss found was similar to ISO-1999 predictions when looking at durations of ten years or more. For the first decade, ISO-1999 predicts a steep increase from normal hearing to NIHL. In this population NIHL was already present at the beginning of employment and increased at the same rate as is predicted for longer exposure durations.

9:40 a.m. – 10:00 a.m.

“Otoacoustic emissions in a hearing conservation program: General applicability in longitudinal monitoring and the relation to changes in pure-tone thresholds”

Hiske Helleman - Clinical and Experimental Audiology, Academic Medical Centre (AMC)

The hearing status of workers (N=233) in a printing office was assessed twice with a seventeen-month interval by pure tone audiometry and otoacoustic emissions (OAEs). In a population with pre-existing hearing loss, a substantial percentage of participants did not have measurable emissions in the higher frequency region (any more). The first research question was how a quality criterion of OAE-measurements based on a minimum signal-to-noise-ratio (SNR) would affect their applicability for monitoring the total population. Secondly, the effects of noise exposure were investigated through overall changes in the audiogram and in OAE-measurements. Our results suggest that – at the group level – OAEs show more change (deterioration) than audiometry. The third goal was to analyze changes at an individual level and compare these to the results on group level. Finally, the possibility of screening for susceptibility to NIHL was examined. Based on an analysis of the data, recommendations will be formulated.

10:55 a.m. – 11:20 p.m.

“Classroom noise and acoustics: Rekindling the fight for standards”

Neil Snyder - American Speech-Language-Hearing-Association

The session will focus on the public and personal health issues related to hearing loss in schools. Since the establishment of the American National Standards Institute (ANSI) approved Standard S12.60-2002 [Acoustical Performance Criteria, Design Requirements, and Guidelines for School], the adoption of the standard by states and local education agencies has been limited. Attendees will learn about the American Speech-Language-Hearing-Association's (ASHA) efforts to raise awareness of the ANSI standard among the public and policy makers in Washington, D.C. ASHA employed a wide variety of tools to achieve policy victories including social networking sites, briefings, grassroots efforts, model legislation, and other tools. Attendees will be able to better understand the legislative process, politics of acoustics, other efforts to adopt the ANSI standard across the country, and the impact of noise on all individuals in a school building.

11:20 a.m. – 11:45 a.m.

“Hearing protector labeling: EPA rulemaking and an updated ANSI S12.42”

Elliott Berger - 3M Occupational Health & Environmental Safety Division

Hearing protector labeling requirements in the United States have been cast in stone since 1979, but all that changed in 2009 with the publication of a proposed rulemaking change by the U. S. Environmental Protection Agency on August 5, 2009. The EPA's intent was to address substantial concerns that have been voiced over the years, especially during a 2003 public workshop. These include: 1) the lack of labeling for electronic hearing protection devices (HPDs) for which traditional NRRs have been inapplicable, 2) the relatively poor correlation between labeled NRRs and the attenuation realized by typical users, 3) the limitations in the existing test methodology which is based upon ANSI S3.19-1974, 4) the need for larger subject pools to test earplugs, and 5) the Agency's concern regarding the inadequacy of its present once-in-a-product-lifetime testing requirement. The EPA proposed rule incorporates new ANSI standards (ANSI S12.6-2008 and S12.68-2007) for testing and computing NRRs, and creates its own test procedures for electronic and impulsive devices since none existed at the time of publication. However, simultaneous with the publication of the EPA rule, ANSI submitted to ballot an updated standard S12.42 with methods to evaluate electronic devices and HPD performance in impulsive noise. This paper will summarize the key features of the new EPA proposed rule as well as the three new ANSI standards, and the interaction of these key parts. At press time the final EPA rule has not been announced; a status report will be provided at conference.

11:45 a.m. – 12:05 p.m.

“Exposure of law enforcement officers to gunfire”

Chucri (Chuck) Kardous - National Institute for Occupational Safety and Health

The National Institute of Occupational Safety and Health (NIOSH) conducted noise exposure evaluations of law enforcement personnel to gunfire. Shooters conducted typical live-fire exercises at indoor firing and outdoor firing ranges using a representative assortment of small firearms. Relevant impulse noise metrics such as peak level, B-duration, number and mixture of impulses, spectral content, energy, kurtosis, and temporal spacing were examined. Peak sound pressure levels ranged from 155-168 decibels (dB). A-weighted equivalent sound levels (L_{eqA}) ranged from 124-128 dB(A). The contribution from secondary gunfire was approximately 1-9 dB(A). Several damage risk criteria and models for predicting hazardous exposure to impulse noise were used to evaluate the potential risk for hearing impairment.

1:45 p.m. – 2:20 p.m.

“Have hardhat, will travel: Hearing conservation in the Great White (?) North”

Christine Harrison, BA, M.Sc., Aud.(C), R.A., Occupational Audiologist, WorkSafeBC

From my early student days, when I bought a pair of steel-toed boots, a high-visibility vest, and a hardhat (with hearing protection, of course) and entered a world that combined audiological assessment with front-line, blue collar, stompin' around the bush... I was in heaven! Born and bred in the same communities around British Columbia as my patients, I have been largely able to span the schism between our genders and ages. Thirty-odd years later (I first met Elliott Berger in 1978, while still in diapers) I remain blessed with a career that allows me to use my grey cells while keeping in touch with the people we purport to help — workers who toil in sometimes outrageously intense, loud noise. Enormous ups and downs have sometimes marked my work; but like a barnacle, I have stuck it out. I will share some of these experiences and how they have shaped me.

2:20 p.m. – 2:45 p.m.

“Evaluating the effectiveness of hearing conservation by program components”

Dr. Nicholas Heyer – Battelle Centers for Public Health Research and Evaluation

Thais Morata – National Institute for Occupational Safety and Health

L. Pinkerton - National Institute for Occupational Safety and Health

S. Brueck - National Institute for Occupational Safety and Health

D. Stanesco - National Institute for Occupational Safety and Health

M. Prince - National Institute for Occupational Safety and Health

H. Kim - Battelle Centers for Public Health Research and Evaluation

B. Sinclair – California State University at Northridge

M. Waters - National Institute for Occupational Safety and Health

C. Estill - National Institute for Occupational Safety and Health

J. Franks - National Institute for Occupational Safety and Health

We studied the effectiveness of specific hearing conservation program (HCP) components in preventing noise-induced hearing loss (NIHL) at three unionized plants from 1970 through 1999. Each had different levels of implementation of the various program components. Components included hearing protection use, audiometric surveillance, noise monitoring, worker training, and engineering controls. Audiometric and work-history databases were combined with historical noise monitoring data for each plant. Changes in production and HCP implementation were collected through audits, interviews and focus groups. Noise exposure was modeled using duration of work stratified within five-decibel exposure categories. This noise metric proved to be a better predictor of NIHL than the equivalent continuous noise level (L_{eq}). Enforced use of hearing protection was found to significantly reduce NIHL, while worker training had no significant impact, and audiometric testing was mildly associated with increased hearing loss. The data did not allow us to evaluate noise monitoring or engineering controls.

2:45 p.m. – 3:10 p.m.

“Mass Transit Noise Levels and Rider Characteristics in New York City”

Rick Neitzel, PhD, CIH – University of Washington

Robyn Gershon – Columbia University Mailman School of Public Health

Julie Pearson – Columbia University Mailman School of Public Health

Lori Magda - Columbia University Mailman School of Public Health

Marina Zeltser - Columbia University Mailman School of Public Health

Allison Canton - Columbia University Mailman School of Public Health

Muhammad Akram - Columbia University Mailman School of Public Health

Jaclyn Spitzer – Columbia University Medical Center

Peter Rabinowitz – Yale University School of Medicine

Martin Sherman – Loyola College in Maryland

To evaluate the potential for noise-induced hearing loss (NIHL) resulting from use of mass transit, we measured noise levels in New York City (NYC) transit systems and compared them to exposure guidelines designed to protect the public from NIHL. Noise levels were measured via dosimetry in a representative sample of subways, buses, and commuter railroads. Of the transit types evaluated, subway cars and platforms had the highest associated equivalent continuous average (L_{EQ}). All transit types had L_{EQ} levels appreciably above 70 dBA, the threshold above which NIHL is considered possible. In addition to evaluation of noise levels, a convenience sample of 933 subjects completed self-administered surveys on transit ridership patterns and hearing health. The median duration of transit use was 1.1 hours/day for those who rode subways exclusively and 0.6 hours/day for those who exclusively rode buses. Median durations of daily transit use were greatest among those who used multiple types of transit. More than 8% of respondents reported experiencing tinnitus frequently after riding mass transit, and a significant association was found between ridership duration and

tinnitus ($p < 0.05$). Given sufficient exposure durations, commuters using mass transit have the potential to exceed the recommended exposure limits of the World Health Organization and the United States Environmental Protection Agency. These results suggest that mass transit noise exposure has the potential to cause NIHL among some riders.

3:30 p.m. – 3:50 p.m.

“Noise Exposure Profiles”

Warwick Williams - National Acoustics Laboratories

What is and why would we be interested in a ‘noise exposure profile’? A noise exposure profile is a tool to demonstrate the effects of cumulative noise exposure over the life-time. Using the tenants of ISO 1999 Acoustics – Determination of occupational noise exposure and estimation of noise induced hearing loss as a starting point noise exposure profiles allow a clear and immediate demonstration of the effects and consequences of excessive noise exposure. This work will show the rational and development of a simple profile including both work and non-work related noise exposures and how the information revealed can be used to better direct hearing loss prevention programs.

3:50 p.m. – 4:10 p.m.

“Noise Exposure of Musicians at the National Ballet Orchestra”

Alberto Behar, IBBME, University of Toronto

With more 70 dancers and its own orchestra, The National Ballet of Canada ranks as one of the world’s top international dance companies. The company performs annual fall, winter and summer seasons plus The Nutcracker. The 68 player’s strong orchestra plays an average of 300 hr per year, including rehearsals and performances. Rehearsals are performed in three venues, one of them in a ballet rehearsal room with little or non absorption. Performances are in the 2006 year built Four Seasons Centre for the Performing Arts, Canada’s first purpose-built ballet opera house. In previous noise exposure surveys performed by the authors’ Laboratory, it was found that the sound levels may pose potential risk of hearing loss to the players. The present survey was performed at the request of the National Ballet, since the musicians complained of excessive sound levels. The survey was performed using 5 dosimeters Quest Mod 300, during 2 rehearsals and 9 performances of the ballet Romeo and Juliet by Sergei Prokofiev. Dosimeters were worn by designated musicians during the entire venue. Some dosimeters were worn by the same musician during all venues, while others were rotated among the musicians. Details of the measurements as well as their results will be presented at the Conference.

4:10 p.m. – 4:30 p.m.

“DNA and other Layman Terms Related to Audiology”

Judith Blumsack, Ph.D. – Auburn University

Curtis Smith, Ph.D., Professor Emeritus – Auburn University

DNA is a term that is familiar to a layman. In this presentation, a case is described in which "DNA" was used to convey a complex idea in a way that attorneys, judges and jurors can understand. A second case is presented to demonstrate how a visual aid can achieve a similar goal. In this latter case, the concept of signal-to noise ratio becomes readily understandable with a visual representation. The overall purpose of this talk is to illustrate the value of making use of the familiar to render technical concepts understandable to laymen.

4:30 p.m. – 4:50 p.m.

“Speech-in-noise screening tests by internet; improving test sensitivity for noise-induced hearing loss”

Monique Leensen - Clinical and Experimental Audiology, Academic Medical Centre (AMC)

The Dutch national hearing association (www.hoorstichting.nl) has developed a hearing-screening test by internet. This test is an automatic adaptive speech-in-noise test using nine different CVC words presented in stationary broadband noise. In a multi-centre study the value of this test in discovering beginning noise-induced hearing loss, is investigated. In addition, the possibility of enhancing the test sensitivity for beginning NIHL using different forms of noise filtering is examined. Therefore, the stationary broadband noise is spectrally filtered by both high pass and low pass filters (cut-off frequency 1.4 kHz), and temporally filtered by 16 Hz modulation. In the study, 50 normal hearing and 50 subjects with different degrees of NIHL performed the tests. Results suggest that both the low pass filtered noise and the 16 Hz modulated noise are more sufficient to discover NIHL in an early stage. However, further analyses and field research should confirm this.