

D-Methionine as an Otoprotectant

Kathleen Campbell, Southern Illinois University, Springfield, Illinois

NIOSH/NHCA Best Practices Workshop on Impulsive Noise

Chuck Kardous, NIOSH, Cincinnati, Ohio, and John Franks, NIOSH, Cincinnati, Ohio

In May 2003, the National Institute for Occupational Safety and Health and the National Hearing Conservation Association co-sponsored the Best Practices Workshop on Impulsive Noise and its Effects on Hearing. The workshop aimed to bring together the leading international experts on impulsive noise from labor, industry, and government an overview of the current state of the art concerning the effects of impulse noise on the auditory system, to develop strategies for the measurement and characterization of impulsive noise, and to identify specific goals and future research priorities. The workshop consisted of a plenary session on the first day and three working group sessions. This paper summarizes the main results of the workshop. Key issues identified by the workshop: (1) need for instrumentation and standards to accurately measure and characterize impulsive noise, (2) need to define impulsive noise metrics and apply animal modeling to humans, (3) characterizing the effect of hearing protection devices on impulse noise in relation to hearing loss, and (4) understanding hearing loss from occupational versus non-occupational exposure.

Number Ratings, NRRs, and the EPA's Labeling Regulation

E.H. Berger, E-A-R/Aearo Company

For nearly 25 years the legally mandated specification of hearing protector effectiveness has been the Environmental Protection Agency's (EPA) Noise Reduction Rating (NRR). In March 2003, the EPA convened a workshop to examine the labeling regulation and the concerns that have been expressed as to its appropriateness and validity. However, besides EPA's avowed intention to revise the regulation, its details and the future are still uncertain. In terms of a scientifically valid approach to predicting protection, one must specify a method of measuring attenuation, define the noise exposure of the population or individual in question, and decide upon a computational method for use of those data (i.e., a rating scheme). The focus of this research is on the latter question, namely computation of a rating for hearing protector attenuation and application of that rating to noise measurements. The conclusion is that a single number computed in a manner similar to the current EPA-mandated NRR, but with suitable adjustments for use with A weighting, provides sufficient precision. To provide additional guidance to the purchaser, two such numbers could be provided on the primary package label—a smaller one to indicate expected protection by most users in practice, and a larger one to indicate the protection that is possible to achieve by individual highly motivated expert users.

Acoustical Archaeology

David Lubman, David Lubman & Associates, Westminster, California

Acoustical archaeology seeks to understand the past by rediscovering ancient uses of sound, and by learning how sound has influenced history. Without our realization, the noise of civilization has separated us from our ancient origins. Recent discoveries suggest that ancient humans placed great importance on sound—because their survival depended on listening. Paleolithics invented practical and spiritual uses for sound, including speech, music, and religion. Myths they created to give meaning to natural sounds survive today

as religious and spiritual ideas. Neolithics further exploited sound by manipulating their built environment. This talk describes recent discoveries suggesting awareness and exploitation of sound by ice-age Neolithic cave dwellers in France. It describes ancient pyramids in Mexico that chirp like the Mayan's sacred bird. It describes conch shell horn uses by the Moche civilization of ancient Peru. It also shows how acoustical archaeology is advancing understanding of the origins of Judeo-Christian civilization. Examples (as time permits): speculations that the shofar—a sounding horn frequently mentioned in the bible—was an Israelite shepherd horn; Gregorian chant arose as an adaptation to architectural changes made by Constantine; and acoustical insights into the design of the shrine of an 8th century Saxon saint.

New Technologies in Hearing Protection: Practical Applications and Research Challenges in Performance Measurement

John G. Casali, Ph.D., CPE, and Gary S. Robinson, Ph.D., Auditory Systems Laboratory, Dept. of Industrial & Systems Engineering, Virginia Tech, Blacksburg, Virginia

In the past decade, several important advancements in augmented hearing protection devices (HPDs) have been developed and marketed, with the objectives of providing more "natural" hearing for the user, improved speech communications and signal detection, reduced noise-induced annoyance, and provision of protection which is somewhat "tailored" for the user's needs, noise exposure, and/or job requirements. Some of these benefits are typically realized in practice and others not. As contrasted with conventional HPDs which attenuate noise through static passive means, augmented HPDs incorporate active (electronic) means for noise cancellation or restoration of desirable sounds, nonlinear active or passive elements for altering attenuation as a function of ambient noise level, uniform attenuation networks with a flat attenuation curve, or adjustable leakage paths which can be varied in their attenuation. Despite these potential benefits, certain types of augmented HPDs cannot be properly marketed, or even marketed at all, in the United States as hearing protection due to the fact that the current EPA-promulgated requirements (CFR, 2002) for HPD testing and labeling do not accommodate their special features, nor completely reflect their performance. This presentation provides an overview of augmented HPDs that are currently available (circa 2003), their general performance, application potential, and the current need for performance testing standards to accommodate them.

Hearing Conservation in the Construction Industry

Carol Merry-Stephenson, CDC/NIOSH, Loveland, Ohio, and Rick Neitzel, University of Washington, Seattle, Washington

NIOSH has been developing, implementing, and evaluating a model hearing conservation program specifically designed to meet the needs of construction workers. The study partners have primarily included carpenters and millwrights. Program elements include effective delivery of yearly audiometry, several different approaches to education and training, noise measurement and TBEAM analysis, and behavioral observation of workers and worksites before and after implementation of the program. In this part of our presentation on "hearing conservation in the construction industry," Carol will present results of this study to date. Lessons learned—including mistakes made along the way—will be discussed. Recommendations will be presented for implementing similar programs throughout the

construction industry. Study materials and training products will be displayed and discussed.

The University of Washington (UW) has been assessing noise exposure levels, hearing loss, and hearing protection use among construction workers in Washington for more than five years. Workers from eleven different trades have been examined as part of this research. In this part of our presentation on "hearing conservation in the construction industry," Rick will discuss some of the noise exposures measured for the various trades, tasks, and tools that have been evaluated by UW, as well as self-reported use of hearing protection among the construction workers who have participated in the research. In addition, newly developed hearing conservation outreach materials designed by UW for use by both safety and health professionals and workers in the construction industry will be presented. Recent research on hearing protection performance and cross-shift changes in hearing levels of construction workers will also be discussed.

Point/Counterpoint: Components in NIHL—Can Their Relative Effects be Fairly and Equitably Discerned?

Robert Dobie, University of California at Davis, Sacramento, California, David Lipscomb, Correct Service Inc., Stanwood, Washington and Mary Wilson, Assistant Attorney General, State of Washington, Seattle, Washington

This section has been organized to update attendees on the concept of allocation between etiologies (causation). In all of hearing conservation, few topics have posed a greater challenge to professionals in this avenue of service than the "allocation" concept. To the uninitiated, the audiometric allocation between causative factors might seem to be a simple and straightforward task. Yet, discussions concerning this process have ranged far and wide. There is little or no controversy concerning the need for such a process. The disagreements occur when methods are proposed, considered and evaluated by professional and/or legal entities.

The intent of our presentations will be to bring our understanding of allocation to the new century. While it is acknowledged that there are still disagreements, more recent thinking and legal decisions may not be well known. Thus, we offer this review and update.

Allocation in Cases of NIHL

Robert A. Dobie, M.D., University of California at Davis and Dobie Associates

Many worker's compensation programs require adjustment of awards for hearing loss when more than one cause is present, and distribute liability among employers when more than one employer has exposed a worker to a hazard such as noise. Allocation between noise and aging is accomplished in some states by basing awards on age-corrected audiograms (making many workers ineligible for awards), or by reducing the award by the ratio of the median expected age-related thresholds to the actual thresholds. Other states require a clinical determination of what a claimant's impairment would likely have been absent occupational noise exposure, then base the award on the difference between this estimate and the actual impairment. Whether in worker's compensation or in litigation, allocation estimates are most reliable when there is a detailed audiometric and exposure history. Audiometric shape and trajectory, combined with an understanding of the epidemiology of NIHL, provide the best evidence in most cases."

Point/Counterpoint

David Lipscomb, Correct Service, Inc., Stanwood, Washington

This presentation will cite two underlying assumptions and raise questions about those assumptions: 1. The validity of pure tone test data without benefit of serial hearing testing; and 2. The accuracy of hearing handicap calculations. The discussion will conclude with a summary of the interactive factors in the function of the auditory mechanism and its neural components. The intent of the summarization will be to remind the attendants of the complexity of function our auditory system possesses, complexity that gives audition its outstanding capabilities, yet, complexity that defies simplistic notions for retrospectively calculating the relative contributions of multiple etiologies.

Hearing Conservation for the Very Small Business

Carol Merry-Stephenson, CDC/NIOSH, Loveland, Ohio

NIOSH has a particular interest in meeting the health and safety needs of small businesses, i.e., less than 50 employees, but also many "mom and pop shops" with 10 or fewer employees. Typically, these enterprises fall through the cracks and have little or no resources to address OSHA issues. This past year, NIOSH has been working with small business owners in the pallet-making industry. The industry has a disproportionate share of illness and injury—including major problems with noise-induced hearing loss. This presentation will present findings and recommendations from a year of field work in this industry. Generalization of issues, approaches, and solutions for other small cottage industries will be made. A prototype training manual for the owners of these small businesses is under development, and the hearing loss section will be showcased.

The Keokuk County Rural Health Study: Prevalence and risk factors for hearing impairment in rural Iowa

Gregory A. Flamme, University of Iowa, Iowa City, Iowa

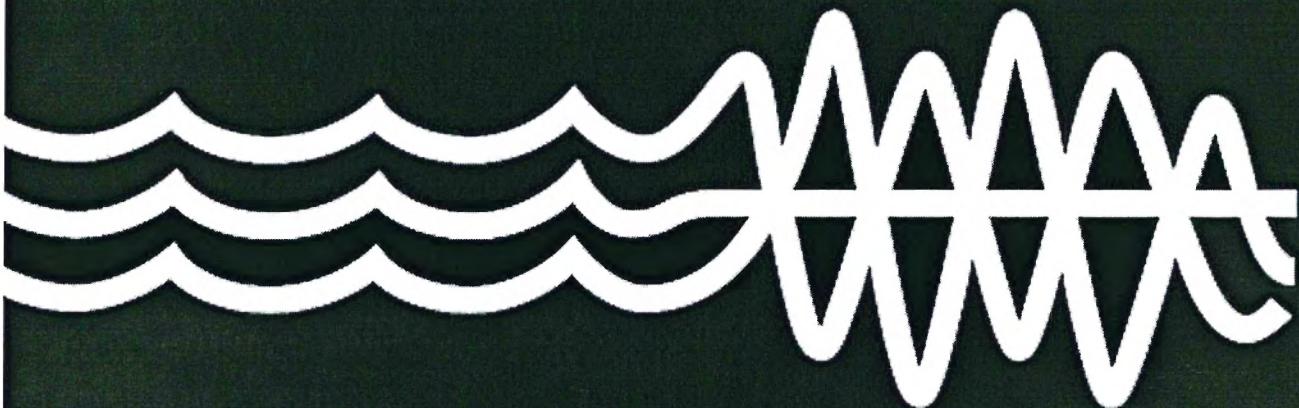
Selected results of a population-based study of health outcomes in rural areas will be presented. Prevalence of hearing impairment will be reported using multiple definitions, ranging between mild hearing damage to interference with loud speech. Relationships between hearing status and noise and non-noise risk factors, including exposures, smoking, and health history, will be discussed. A high prevalence of impairment and significant relationships with multiple risk factors were found. Project supported by NIOSH.

Noise Exposure Levels for Wood Industry Workers

Michael Stewart, Karl Koltes, and Mark Lehman, Central Michigan University, and Jim Bennie, Jim Dougovito, Joe Pryal, Angelo St. Juliana, and Jayne Zzukalowski, M-TEC at Bay College

Individual dosimetry was used to determine noise exposure levels for workers in 94 different wood industry jobs. Results revealed over 40% of the wood industry jobs exhibited 8-hour TWAs over 90 dBA, 33% of the jobs had TWAs between 85-89 dBA, while less than 25% of the jobs had 8-hour TWAs below 85 dBA. Eight-hour TWAs for the loudest jobs were over 100 dBA. Eight-hour time-weighted averages (TWAs) and daily noise doses obtained using the currently mandated Occupational Health and Safety Administration (OSHA) measurement criteria were also compared to those obtained using the American Conference of Government Industrial Hygienists (ACGIH) recommended criteria. The ACGIH method yielded significantly higher 8-hour TWAs and daily noise doses than the OSHA method. The effect of variables such as saw size, season, and wood type were also examined. Implications of this study will be discussed.

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