



UPDATE

VOLUME 17 • ISSUE 3

The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

Hearing Loss in the Military: A Report from the National Academies of Science



By Larry E. Humes, PhD

Editor's Note: The National Academies perform a public service by bringing together experts in all areas of scientific and technological endeavor. These experts serve pro bono to address critical national issues and give advice to the federal government and the public. Four organizations comprise the Academies: the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine and the National Research Council.

In 2002, the U.S. Congress passed the Veterans Benefit Act, Public Law 107-330. Section 104 of this legislation charged the Veterans Administration (VA) to contract with the National Academies of Science for a study of noise-induced hearing loss and tinnitus [often referred to as ringing in the ears] in the U.S. military. The committee, convened by the Institute of Medicine (IOM) of the National Academies to conduct this study, was charged with reviewing the following for the period from World War II to the present: (1) the available data on hearing loss that could be expected among members of the armed forces; (2) sources of hazardous noise exposure during military service; (3) the levels of noise exposure necessary to cause hearing loss or tinnitus; (4) the time course of hearing loss following noise exposure, including whether onset can be delayed; (5) risk factors for noise-induced hearing loss and tinnitus; and (6) compliance by the military services with requirements for audiometric testing and the adequacy of the services' hearing conservation programs to protect the hearing of service members.

Why did Congress feel compelled to pass such legislation? It is well known that people serving in the military will, at some point, be exposed to high-intensity noise of various types. Some may develop hearing loss, especially for high-frequency sounds, or tinnitus, or both, as a result of their noise exposure. Hearing loss or tinnitus incurred or aggravated during military service may qualify veterans for services and financial compensation from the VA. Since World War II, the human and financial costs associated with hearing loss among military veterans have repeatedly drawn attention to noise, hearing loss, and the need for hearing conservation in military settings. In recent years, tinnitus has emerged as a significant concern as well.

The VA reported that the 2.5 million veterans receiving disability compensation at the end of fiscal year 2003 had approximately 6.8 million separate disabilities related to their military service.¹ Disabilities of the auditory system, including hearing loss and tinnitus, were the third most common type, accounting for nearly 10% of the total number of disabilities among these veterans. For the roughly 158,000 veterans who began receiving compensation in 2003, auditory disabilities were the second most common type of disability. At the end of 2004, the compensation payments to veterans with hearing loss as their major form of disability represented annual costs of some \$660 million, with about 85% of the annual compensation going to veterans who served in World War II, Korea, or Vietnam. The corresponding annual compensation payments to veterans with tinnitus as their major disability were close to \$190 million.

In the spring of 2004, a committee of 13 individuals (including CAOHC Council members Elliott Berger, Richard Danielson, Donald Henderson, and Mark Stephenson) with expertise in the areas of audiology, bioacoustics, military preventive medicine, occupational medicine, epidemiology, otology, industrial hygiene, and hearing conservation programs was constituted to address the Academy's charge. The committee met and talked via phone numerous times over a two-year period and approved a final report in September, 2005.

Their final report, entitled *Noise and Military Service: Implications for Hearing Loss and Tinnitus*, is divided into seven chapters. The first chapter provides general background information on the primary topics discussed in greater detail in the ensuing chapters. Chapters 2 and 3 review the

¹Veterans may have hearing loss and other disabilities that have been determined to have been incurred during or aggravated by military service but that do not qualify for disability compensation payments (a "zero percent" service-connected disability). Veterans with service-connected hearing loss who do not qualify for any disability compensation payments are not included in the VA data on numbers of disabilities or numbers of veterans with disabilities. All veterans with service-connected tinnitus qualify for compensation payments.

continued on page 5

Content	
	PAGE
Hearing loss in the military	1
Chair's Message	2
OHC Corner	3
Classroom acoustics	4
Determination of work relatedness	6
OHC Courses	10
Gulf-coast OHC's & CDs expiration extended	11
NHCA Conference	11



Published by the Council for Accreditation in Occupational Hearing Conservation, a not-for-profit organization dedicated to the establishment and maintenance of training standards for those who safeguard hearing in the workplace.

Articles should be submitted with a black and white photograph of the author. The UPDATE is available to individuals not certified by CAOHC at an annual subscription rate of \$20.

Payment must accompany request:

555 E. Wells Street / Suite 1100

Milwaukee, WI 53202-3823

Phone (414) 276-5338

Fax (414) 276-2146

E-mail: info@caohc.org

- **Editor and Publications Committee Chair**
Elliott Berger, MS, INCE. Bd. Cert.
- **Contributing Editor Current Issue**
Mark Stephenson, PhD
- **Committee Members**
Paul Brownson, MD, FACOEM, FAAFP
Robert Bruce, PE, INCE. Bd. Cert.
Donald Henderson, PhD
Diane DeGaetano, RN BSN CAT COHN-S
Thomas Hutchison, MA MHA FAAA CCC-A
- **Executive Director**
Barbara Lechner
- **Administrative Assistant**
Chris Whiting
- **Graphic Designer**
Kathryn Peterson

Opinions expressed in the UPDATE are those of the authors, and do not necessarily reflect official CAOHC policy. © CAOHC 2005

Printed on recycled paper PRINTED WITH SOYINK

Opt-Out Option

If you wish to have your name removed from mail solicitations from vendors who have purchased the CAOHC database, please notify CAOHC staff via fax at 414/276-2146; or e-mail to info@caohc.org.

CAOHC Approved Courses

When you are registering for a recertification course (or if your fellow staff member is registering for the first time at a certification course), please confirm with the registrar that "this is a CAOHC approved" course. Only certified Course Directors, who have received a course approval certificate from the CAOHC Executive Office, can conduct an occupational hearing conservation course that leads to CAOHC certification or recertification. Course Directors must display this certificate of approval in view of their students. If you don't see it, please ask your Course Director.

If you are uncertain whether the course you are planning to attend is certified by CAOHC, please contact Chris Whiting at the CAOHC office at 414/276-5338 or e-mail info@caohc.org



Chair's Message For The Record: Record it!

By Richard W. Danielson, PhD

Quite unlike the noisy shops and plants where our noise-exposed employees work, the microfiche records room of the National Archives in Washington, DC has an eerie hush. When I visited it a few years ago, I found 200 people quietly reading, with a periodic interruption of a muffled "AH HAH! YESSS!" as someone found the special gem they had been seeking... the name of a relative on a ship's manifest from 1898, or a 1910 Census record. Thanks to careful documentation and retention of these treasured records, anyone can piece together the fabric of their heritage. I had my own special joys of using such records to learn about my family.

Though most of us don't make a profession of such detailed review of genealogical records, our jobs do rely on **recordkeeping** in our hearing conservation practices. Records of audiometric and program data are the foundation of our ability to monitor the success of hearing loss prevention efforts. Without appropriate documentation, it's impossible to look into programs for issues and trends. Recently, the Institute of Medicine (IOM) took on the task of conducting a monumental review of hearing loss and tinnitus among veterans with military service from WWII to the present. (See Larry Humes' summary in this issue of the UPDATE). The committee examined material from peer-reviewed journals, books, reports prepared by or for the military services, and documents and data provided by the military. Ideally, the IOM draws its conclusions from published peer-reviewed reports of longitudinal, population-based studies of noise-induced hearing loss and tinnitus in humans in military settings. Although the committee did review hundreds of documents, it became obvious that there were few studies meeting the stringent IOM requirements. Therefore, the committee was compelled to turn to other sources of evidence to adequately assess whether hearing conservation programs have reduced the prevalence of hearing loss in the military.

The committee found that military service medical records revealed that less than 30 percent of personnel who left active duty from the early 1980s to 2002 had both an entry and separation audiogram. This lack of records significantly hinders efforts by the Department of Veterans Affairs to determine if veterans had hearing loss at the time of separation from active duty. Finally, there are few, if any, military health records available to show whether a service member admitted to (or denied) tinnitus when on active duty. As a former military audiologist, I was personally grieved that the committee could not access more definitive information, since I had witnessed improvements in hearing conservation practices that just weren't documented. Recommendations have been made to change recordkeeping practices, but it will take a long time to fully improve these processes.

Similarly, Peter Rabinowitz's article on Workers Compensation also reminds us of the importance of adequate documentation. All too often, compensation decisions are made without appropriately documented evidence (e.g., a pre-existing hearing loss, or lack of a termination audiogram).

As you read this, are you contemplating how you could improve your own documentation? Consider, for example, your audiometric data. There is much truth in the old saying, "garbage in, garbage out." However, your training and skills as an Occupational Hearing Conservationist (OHC) allow you to be on the job, and on target to spot (and repair) errors before they go into the database. As an OHC, you are a better resource for hearing loss prevention programs than other individuals who (unfortunately) just "do the audiogram," merely push the TEST button, and lift the

continued on page 3

OHC Spotlight

My wife, Angela Roberts-Khandwala, BS COHC, is certified by CAOHC as an Occupational Hearing Conservationist (OHC) and she received your latest newsletter—which she usually reads in bed at night. I noticed your appeal for future spotlights so I thought I would e-mail you about her.

My wife does an extraordinary job not only at work but at home. She has worked for a non-profit agency here in California for the past four years. For the industrial program she has managed for two years, she maintains the hearing conservation program as a vendor for over 60 companies. In addition, she was promoted to run the school program where she schedules over 100,000 kids for testing using audiometrists and mobile vans for over 100 school districts in 19 counties.

While running these two programs, she is finishing her master's degree in audiology, as well as caring for our



Roberts-Khandwala pictured demonstrating to children why animal ears hear better than human ears.

four children who range in age from 8 years to 8 months. As an added bonus, she just passed a national exam for audiologists. She is awesome! Her passion has been audiology because our two oldest daughters have hearing loss. She received an Associate of Arts degree in sign language, later switching her major to audiology when we learned that surgery had improved our daughter's hearing. If all goes according to plan, Angela will be receiving her Master's degree in

December of this year!

I am so proud of her and don't think she gets the recognition she deserves. I appreciate CAOHC's "spotlight" on her so she knows how much, not only I, but her employers and clients appreciate her work.

For the Record – continued from page 2

paper from the printer – nothing more. Instead, you can recognize unusual results, and if needed, immediately conduct a retest to resolve the problem (or even a standard threshold shift [STS]).

In our Professional Supervisor Courses, CAOHC is stressing recordkeeping techniques that will improve the quality of supervisory review in hearing conservation programs, and hence provide improved service to employees and employers. For example, physicians and audiologists receiving medical referrals from hearing conservation programs should routinely receive the benefit of access to all previous audiograms and employee noise-exposure data, in order to assess occupational hearing loss. In return, these consultants should provide clear opinions about the nature and diagnosis of the hearing loss (including audiometric results at 3000 and 6000 Hz, that sometimes are not tested in clinics) to the occupational health personnel at the worksite.

What kind of recordkeeping is important? Obviously, OHCs maintain audiometric data (e.g., number of tests, STS, and number of referrals) and audiometer calibrations, but they can also keep track of other data that can improve efficiency of their operation and support their program. Hearing conservation records don't show their value until examined and REPORTED. Think about what you could be reporting to your Professional Supervisor or employer. How about documenting the time required for set-up and

shut-down, or the number of workers who can't insert their hearing protection correctly during a fit-check?

As electronic databases become more common (and more complex), the risk of data loss grows. Are you routinely backing up your data? Those of us who live in coastal areas of the U.S. are getting our share of crises, ranging from electrical power loss to complete loss of equipment. As critical as it is to gather data, it's equally as important to protect working and archival files. Consider your own situation and how you would attempt to retrieve lost data, should your primary system be lost. Double-check your policies for backing up and storing data (even in locations other than your principal work site). No insurance reimbursement check can replace actual data.

Would the IOM report have provided a clearer picture of the risks of noise exposure from military service if more audiometric records of WWII veterans had been available? How many Workers Compensation claims would have been denied (or approved) if better records had been available? More importantly, how many noise-exposed workers could have been alerted about their progressive hearing loss, if they'd been counseled earlier when the first indications of noise-related hearing loss were seen in their audiogram? The thought of such possibilities should motivate us to be even more enthusiastic and thorough in our roles as hearing conservationists. Those who follow us will appreciate OUR archives.

Making Noise About Quiet Classrooms

By David Lubman, FASA



Kids can't learn well in noisy classrooms

Everyone recognizes the benefits of education. Nearly everyone recognizes the importance of classroom learning to education. Since most classroom education is obtained "by word of mouth and by listening" (Knudsen, 1950) good classroom acoustics is critical to classroom learning. Given the importance of good classroom acoustics, it is startling to realize that about two-thirds of American classrooms are too noisy or too reverberant for effective teaching and learning.

Don't get me wrong. I'm not saying that noisy classrooms are making kids deaf, or that classroom acoustics are so bad that hardly anyone can understand a word. In a nutshell, the problem is that typical classroom acoustic environments are suboptimum for normal listeners and worse for listeners with special needs. You can think of this not as a problem so much as an opportunity. We should be able to realize sizable gains in educational achievement by instituting fairly modest classroom acoustical reforms. The momentum to do so is substantial and growing.

Unlike many other problems, the classroom acoustics problem has a practical solution. The good news is that a recent ANSI (American National Standards Institute) standard spells out the requirements for good classroom acoustics (ANSI S12.60-2002). Its advocates believe that ANSI-compliant schools (schools that implement the ANSI standard) are much more effective learning spaces. Advocates anticipate that compliance will yield significant gains in student achievement. They believe that ANSI-compliant schools will be more pleasant places to learn because they are less stressful for students and teachers. They anticipate less classroom conflict, and therefore, greater school safety. And, because many students with special needs are more easily accommodated in mainstream classrooms, ANSI-compliant schools are more socially inclusive. All-in-all, the modest cost for ANSI compliance will be repaid many times over with respect to providing children with a better education.

Since the ANSI standard is at present voluntary, the current challenge is to convince the public to demand ANSI compliance. It will take lots of convincing. That's where CAOHC comes in! The 21,000 certified Occupational Hearing Conservationists (OHCs) comprise a potentially powerful force for educating the public about hearing-related issues. OHCs can use knowledge and status as hearing conservation experts to help educate the public to the benefits of ANSI compliance. As a first step, CAOHC technicians may want to become more knowledgeable about the role of classroom acoustics in learning.

Low reverberation time and low noise levels are primary

Educational audiologists say that two requirements must be met for effective lecture learning in typical small classrooms.

The first is that classroom reverberation time should not exceed about 0.6 second.¹ That can be achieved with a good suspended acoustical ceiling. It is least expensive to specify a good acoustical ceiling in new construction. Acoustical ceilings can also be installed during a major renovation.

¹ Reverberation time in the octave bands at 500 Hz, 1 kHz, and 2 kHz.

The second requirement is a minimum 15-dB speech-to-noise ratio. Educational audiologists also say that the teacher's voice level should be at least 15 dB above the background noise. Achieving a 15-dB speech-to-noise ratio in the back of typical small classrooms, far from the teacher, can be more challenging. To do so, the background noise level should not exceed 35 dBA. That's about as quiet as a decent conference room or a suburban living room. HVAC (heating, ventilating, and air conditioning) systems are usually the critical element controlling classroom background noise levels.

Here's where it pays to bring in a HVAC noise expert. At the present time it seems impossible to meet the ANSI noise requirement with wall-mounted air conditioners. Fans and compressors should be located outside the classroom. Central HVAC systems are capable of providing the necessary quiet. Properly ducted roof-mounted or outboard systems have also been shown capable of providing low noise levels for a modest incremental cost [see Fig. 1]. It is best to design low noise in new construction. It can be very expensive or impractical to achieve low noise HVAC in renovated classrooms.



Figure 1 - Wall mounted heat pumps make classrooms too noisy for learning. This older bungalow classroom was affordably quieted by replacing a noisy wall-mounted HVAC with the quieter exterior unit shown here. The above-ceiling air distribution system (not shown) was also upgraded.

How did classrooms become so noisy with hardly anyone noticing?

How did schools become such acoustically hostile places for learning? Objective acoustical requirements for lecture teaching and learning were known since the mid-20th century. But there was no written standard for classroom acoustics at that time. Absent a standard, school architects were free to ignore acoustics in classroom design. Unless noise and reverberation were horrid in the extreme, school officials had no ready way to tell when acoustical conditions were unsatisfactory for learning.

One might expect teachers and students to complain about poor classroom acoustics. Some do, of course, but oddly enough, many others are oblivious to the impact of poor acoustics on the ability of teachers to lecture without straining their voices, as well as on students' ability to attend to their teachers without straining to hear. Maybe non-complaining students and teachers have become more tolerant of noise because of its constant presence in their lives. But complain or

continued on page 7

Hearing loss in the military – continued from page 1

mechanisms of noise-induced hearing loss and associated risk factors, as well as noise and noise hazards associated with military service. Chapter 4 focuses on an important and related topic, tinnitus, especially its association with noise exposure and hearing loss. Chapter 5 turns to the nature and effectiveness of hearing conservation programs in the armed services, and Chapter 6 presents the results of an audit of the service medical records of military personnel sampled from World War II to 2002, in order to see if they were receiving their required audiograms. Finally, Chapter 7 summarizes the findings and addresses the specific questions and issues posed in the Statement of Task and in Public Law 107–330.

An important aspect of the process by which the committee developed its findings involved establishing a suitable “yardstick” to evaluate the strength of the evidence from scientific and clinical studies. For example, what types of studies would provide convincing evidence that there was a causal association between military noise exposure and subsequent noise-induced hearing loss and tinnitus? The committee then applied the yardstick to the evidence uncovered in its extensive review of the literature on noise-induced hearing loss and tinnitus in the U.S. military. The collection of findings from the report, together with the review of the evidence supporting each finding, represent the heart of the report.

Once the report was written and approved by all 13 experts on the committee, it underwent review by eight additional experts. An independent study coordinator and review monitor, two individuals not associated with the committee or the staff assigned to the project, coordinated the review process. The committee and IOM staff gave careful consideration to all of the reviewers’ suggestions and incorporated many into the final draft. Given the scope of the committee’s charge and the breadth of the resulting report, it is not possible to provide a full review of the entire document for the *Update*. Rather, the findings pertaining to hearing conservation and hearing protection are summarized. For additional details and findings, the reader is referred to the full report (Humes, Joellenbeck, & Durch, 2005) available at: <http://www.iom.edu/report.asp?id=29957>.

Responding to Noise Risks: Hearing Conservation Programs in the Military

Compliance with requirements for use of hearing protection devices (HPDs) is crucial for an effective hearing conservation program. There is limited or suggestive evidence from studies conducted in the U. S. military to conclude that use of HPDs and the level of real-world hearing protection these devices provide have not been, nor currently are, adequate in military hearing conservation programs. However, the studies conducted involving U.S. military personnel are generally consistent with studies from other settings that provide additional evidence that the use and real-world protection of HPD’s are not adequate.

Results of annual audiograms are available for approximately half of military service members in hearing conservation programs reporting compliance with testing requirements during the period 1988–2004. Incomplete reporting, lack of compliance with requirements for annual

audiograms, or both, severely limit the usefulness of the military’s centralized database and the conclusions that can be drawn from it regarding hearing conservation program effectiveness.

The evidence reviewed by the committee—including information on the effectiveness of available hearing protection devices and indicators regarding use of hearing protection, the completeness of audiometric monitoring, and compliance with requirements for entrance and separation (exit) audiograms—was sufficient to conclude that hearing conservation programs in the military currently are not adequate to protect the hearing of military service members, and have not been adequate for the period since World War II. This has important human health, personnel readiness, and financial implications.

Reports of Audiometric Testing in Service Medical Records of Military Veterans

Approximately 3,500 military service records from World War II through 2002 were reviewed and examined for the presence of entrance and separation audiograms. Audiometric testing at both entrance into and separation from service has been extremely limited, even in the most recent eras, and did not exceed 34% in any branch or era when using a +/- 60-day window for analysis (i.e. the entrance audiogram had to occur within 60 days following the start of duty, and the exit audiogram within 60 days of a service member’s release from active duty). Considering just entrance or separation audiograms independently, improved the compliance to values of 70% and 54%, respectively.

Conclusions

To understand the basis for each of these findings, one must review the supporting evidence provided in the corresponding chapters of the full report. Nonetheless, the foregoing findings clearly suggest that there is considerable room for improvement in hearing conservation programs in the U.S. military. Judging such programs to be inadequate is not intended to diminish the laudable efforts made by many individuals within the military over the past several decades to implement adequate programs. The evidence simply suggests that *more must be done* to make these programs effective and to minimize the occurrence of noise-induced hearing loss and tinnitus among U.S. military personnel.

The committee’s hope is that this report will highlight the problems, as well as potential solutions. Together with the suggestions for operational changes that the committee provided in the conclusions and recommendations of the document, this material may supply the impetus and guidance to improve hearing conservation practices in the U. S. military.

Reference:

Humes, L. E., Jollenbeck, L. M. and Durch, J. S. (2005). “Noise and Military Service, Implications for Hearing Loss and Tinnitus,” Inst. of Medicine of the National Academies, The Natl. Academies Press, Washington, DC.

Larry E. Humes is a Professor, Department of Speech and Hearing Sciences, at Indiana University. He has over 125 scholarly publications and more than 170 presentations on a variety of topics in audiology and hearing science. His most recent research activities have been focused on age-related changes in auditory perception, including speech-recognition ability, and on outcome measures for hearing aids.



Determining When Hearing Loss is Work Related

By Peter M. Rabinowitz, MD MPH

Case vignette 1:

John T., a 47-year-old worker, gets an annual audiogram at his worksite. It is his 14th year on the job in a metal factory. After age-correcting the results of the audiogram, the Occupational Hearing Conservationist (OHC) calculates a 12-dB average shift at 2,3,4 kHz from baseline in his left ear, and a 9-dB average shift from baseline at 2,3, and 4 kHz in his right ear. The average of thresholds at 2, 3, and 4 kHz in the left ear is 28 dB. A repeat audiogram two weeks later is essentially unchanged.

The OHC notifies the Professional Supervisor (PS) of the audiometric component of the hearing conservation program (a physician) that Mr. T has had a confirmed threshold shift.

The PS makes a determination that, more likely than not, Mr. T's hearing loss was work related. He notifies the safety director (whose job it is to maintain the Occupational Safety and Health Administration [OSHA] 300 log) that the case of hearing loss needs to be reported in the workplace OSHA log.

The next day, the safety manager notifies the PS that he has decided that the loss is not going to be recorded because Mr. T has been regularly instructed in the correct use of hearing protection at work, and that Mr. T is known to enjoy going to NASCAR rallies on weekends. The safety manager, whose bonus is tied to safety performance figures, also tells the PS that to report the case in the OSHA log would hurt the company's chances to achieve their safety target numbers for the year, and could also risk increasing their workers compensation insurance rates. In a conversation about the situation with a plant administrator, the safety manager notes that this physician has called several other injuries work related during the past year, and the administrator wonders whether it would be better to hire a different occupational medicine provider.

Case vignette 2:

Mary P., a worker in a different company, is noted by the OHC to have a confirmed, age-corrected threshold shift from baseline in the right ear. Ms. P has been working at the plant for 3 years. The area where she works is considered to be noisy, and she wears hearing protection regularly. She has also been noticing some fullness in her left ear over the past two months, but fails to mention this on her audiometric questionnaire.

The OHC notifies the safety manager that the employee has had an age-corrected threshold shift. The safety manager, intent on being cautious about possible cases of noise-induced hearing loss, reports the case on the OSHA log as work-related hearing loss.

One month later, Ms. P is diagnosed with a smoldering ear infection. After appropriate treatment, her hearing loss is found to have resolved.

Introduction

These cases illustrate some of the issues involved with the determination of whether hearing loss in an employee working in a noisy area is or is not work related. In the first case, conflict arose about whether an employee's hearing loss could be explained by off-the-job noise. The tension between management's incentive to keep recordable illnesses and injuries to a minimum and the need to accurately detect a case of occupational hearing loss is evident. This situation can result in "false negatives" of cases of work-related hearing loss that fail to be reported and acted upon. The second case illustrates the consequences of calling a case of hearing loss work-related noise-induced hearing loss (NIHL), and in doing so, overlook a potentially treatable medical condition due to a "false positive" assumption, that in a noisy work area all cases of hearing loss are work related. It also demonstrates the pitfalls of not involving a Professional Supervisor in the follow-up of problem audiograms.

One of the most important responsibilities of the OHC or the PS, therefore, is to work cooperatively in the determination of whether an individual's hearing loss is considered to be work related. If a worker's hearing loss is truly due to noise exposures on the job, it is important for that to be recognized so that steps can be taken to reduce workplace noise exposure for that individual and any similarly exposed colleagues. It is equally important to recognize if there is an underlying medical problem or significant off-the-job noise exposure so that these can be addressed.

This article will outline some of the pertinent issues relating to work-relatedness determinations, including the responsibilities of the OHC and the PS. It is by necessity only an introductory treatment of a very complex subject. For an in-depth discussion of this process, readers are advised to consult Dr. Robert Dobie's book *Medical-Legal Evaluation of Hearing Loss* (Dobie, 2001).

When is it necessary to determine work-relatedness?

Whenever a worker has experienced a persistent standard threshold shift (STS), it is necessary to determine whether the loss is work related. An STS is a worsening of at least 10 dB in average hearing thresholds for the frequencies of 2, 3, and 4 kHz in either ear compared to the most recent baseline (age correction optional). Note that it is possible to have an STS that is not recordable (since the absolute value of threshold average at 2, 3, and 4 kHz is less than 25 dB) yet still could be work related and require worker notification and follow-up.

Work-relatedness determinations are also necessary when a worker has filed a workers compensation claim for hearing loss. The focus of this article, however, will be work-relatedness decisions at the time an STS occurs.

Who determines if a case of hearing loss is work related?

The recent OSHA final rule on recordkeeping related to hearing loss states that the determination of work-relatedness should be made by a "physician or other licensed health care professional."

Classrooms – continued from page 4

not, it is indisputable that poor classroom acoustics take a toll on teachers and students.

Classrooms are stages for teachers

Many good classroom teachers are actors, and the classroom is their stage. Teachers use their voices to keep students engaged in learning just as stage actors use their voices to engage theater audiences. You can be sure that theaters give a high priority to good acoustics for speaking and listening. Why don't more schools do the same? Teachers strain their voices to be heard in classrooms with poor acoustics. Compounding that voice strain, teachers need to repeat material for students who didn't hear it the first time because of poor acoustics. In one way, classrooms are even more acoustically challenging than theaters. Although theater audiences need not be heard by stage actors, students must be heard by their classroom teacher. Since most students lack the voice skills of teachers and actors, teachers must strain to hear students in acoustically poor classrooms. Few teachers realize how much poor acoustics contributes to their end-of-day exhaustion.

Listening strain breaks the engagement

Even good students strain to listen in classrooms with poor acoustics. If acoustics are not too bad, students will miss or misunderstand a word only now and then. That might be



tolerable because good students can often “fill in” the missing words from their own knowledge and from the built-in redundancies of language. But when students miss key words or too many ordinary words they may also miss key points of the lesson. After only a few minutes of strained listening even highly motivated students become discouraged and may lose engagement in learning. Discouraged students may think they got that way because they are poor learners. Few students realize how much their ability to learn is stolen by poor classroom acoustics.

The burden of poor classroom acoustics falls unevenly

Poor classroom acoustics hurts all learners. But its burden falls disproportionately on young students just learning to read, on students with listening, language, and learning disabilities, and on poorly-motivated students.

Young students need to hear new vocabulary very clearly before they can learn to speak and read the words. Good classroom acoustics are necessary for learning to speak and read a new language. But it is not only the very youngest

students who are learning a new language. America has once again become a nation of immigrants. Many school districts have a high percentage of English-language learners. Learning English is tough enough without handicapping students with poor acoustics.

Kids with even mild hearing deficits pay a dear price. On any school day, nearly one in five kids between the ages of 6 and 19 attend school with at least mild temporary or permanent hearing disabilities. Burdening poor or poorly motivated learners with poor classroom listening conditions often results in disengagement in learning, disruptive behavior, or even dropping out of school.

OHC technicians can make noise about quiet classrooms

As mentioned above, poor classroom acoustics is a widespread problem in American schools. Kids can't learn well in such classrooms. That problem hurts Americans individually and collectively. Fortunately, the classroom acoustics problem has solutions outlined by ANSI standard S12.60-2002. At this time the ANSI standard is not mandatory. Schools or school districts must voluntarily adopt the standard to impose it on contractors. But schools must be educated and coaxed to adopt the standard. OHC technicians are already educated about hearing issues. As educated hearing professionals they are better positioned than the general public to advocate with schools on acoustical issues. For example, they can speak at local education meetings such as PTAs. Advocates of the ANSI standard hope that OHC technicians will join forces with other acoustic and hearing professionals to work for good classroom acoustics.

References:

ANSI (2002). “Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools,” Am. Natl. Stds. Inst., ANSI S12.60-2002, available free of charge at the ASA Standards Store, retrieved 9/28/2005 from: <http://asastore.aip.org/>

Case study, Wildomar Elementary School. Retrieved 9/28/2005 from <http://www.xpedio.carrier.com/idc/groups/public/documents/marketing/casestudy30.pdf>

Knudsen, V. O. and Harris, C. M. (1950 and 1978). *Acoustical Designing in Architecture*, Acoustical Society of America, New York, NY.

Certification Workshop for Course Directors

The Council will conduct a Course Director Workshop on Sunday, February 19, 2006 at the Hyatt Regency Downtown at Tampa City Center, Tampa, Florida, immediately following the National Hearing Conservation Association (NHCA) conference.

This workshop is a requirement for new Course Director (CD) certification and is currently an optional method of recertification for current CDs. Attendees must submit an application for approval by the CAOHC Screening Committee prior to the workshop.

All questions may be directed to Barbara Lechner, Executive Director, at 414/276-5338. CD application forms are available on-line at www.caohc.org and registration information for the workshop will be posted in mid-November.

Hearing Loss is Work Related – continued from page 6

1904.10(b)(6) “if a physician or other licensed health care professional determines that the hearing loss is not work-related or has not been significantly aggravated by occupational noise exposure, you are not required to consider the case work-related or to record the case on the OSHA 300 log.”

[Licensed audiologists are included by OSHA definition as a health care professional.]

CAOHC, in its scope-of-practice document for the Professional Supervisor of the audiometric component of a hearing conservation program (CAOHC, 2003a), states that the PS will:

- a. Review the audiometric history and information regarding the adequacy of the testing environment and performance
- b. Review the medical history and determine whether additional medical evaluation is indicated. If such an evaluation is required, either performs the evaluation or makes appropriate referral for such testing, and then reviews the test results.
- c. Review the history of exposures to occupational and non-occupational noise, as well as hearing protector use and exposures to ototoxic chemicals.
- d. Based on the above evaluation, either make a determination of work-relatedness or make appropriate referral for final determination whether the hearing loss is work-related or due to other factors.

CAOHC has also stated that the scope of practice for an OHC (who is not a physician or audiologist) does *not* include the determination of work-relatedness, since the OHC is not allowed to interpret audiograms, diagnose hearing disorders, or assume the role of a Professional Supervisor (CAOHC, 2003b). However, the OHC plays a crucial role in assembling the evidence necessary to make adequate decisions regarding work-relatedness.

Steps in determining work-relatedness

Table 1 [see page 9] outlines the steps involved in making a determination of work-relatedness. The first is to evaluate the validity of the test results. For example, is this a permanent rather than a temporary threshold shift, and have shift calculations (including optional age correction) been correctly performed? Is there a sudden jump in thresholds from previous tests? Were there problems with the employee not understanding the test instructions? The CAOHC hearing conservation manual (*Hearing Conservation Manual*, 4th ed., 2002) has an appendix

that can be useful to an OHC in ensuring that problems with validity have been addressed. Otoscopy can help rule out obstruction due to cerumen that could interfere with test validity. The OHC should note any unusual behavior during the test that could be suggestive of malingering, but should never confront an employee with such an accusation.

The second step, assuming the test is valid, is to assess whether the employee has been exposed to potentially damaging noise (or ototoxic chemicals) at work. This can be a trickier process than some might think. Some workers may be getting annual hearing tests in a hearing conservation program, yet not be exposed to occupational noise sufficient to cause damage. The OSHA action level for noise exposure of 85 dBA is considered to be the level where risk increases significantly, but it should be kept in mind that some workers may lose hearing at time-weighted exposures less than 85 dBA. All noise exposure readings for the employee’s job during the period when hearing loss has taken place should be assembled for the PS to review. Obviously, hearing protection use can affect the degree of noise exposure, yet the field performance of hearing protectors may vary greatly from the labeled NRR (noise reduction rating), due to differences in fit and usage (Berger, et al., 1998). Therefore any available information about type of hearing protection worn, assessment of HPD (hearing protection device) fit, and frequency and consistency of use, is vital to include in the assessment. There is some evidence that exposures to significant levels of certain chemicals such as organic solvents and heavy metals could be toxic to hearing (Morata, 2003), and any information related to the employee’s exposure to such substances should also be provided to the PS.

The third step is to determine whether the hearing loss appears consistent with noise-induced hearing loss, or whether instead a medical condition is present that can completely explain the loss. A review of the audiometric history is essential to determine whether the progression and pattern of the hearing loss is consistent with NIHL. Criteria for this judgment have been published (ACOEM, 2003), and include a “notch” in the audiogram in the frequencies around 4 kHz. It is important, too, for clinicians to consider whether the audiometric pattern is more suggestive of another disorder, such as presbycusis alone, ear infection, or a retrocochlear lesion. This process is termed “considering the differential diagnosis” and requires a thorough knowledge of ear disorders. It also may involve legal liability if a significant medical problem has been missed. Information from the audiometric questionnaire about medical risk factors and ear symptoms is important for the PS to review, and s/he may elect to personally examine the employee and take a more complete history. The Professional Supervisor may also decide to refer an employee to an audiologist for full audiological testing, and/or to an ENT (Ear Nose and Throat) specialist for an evaluation of medical causes. Even if the hearing-loss case appears to be at least in part work related, the PS should ensure

continued on page 9

Hearing loss is work related – continued from page 8

Table 1: Steps in determining work-relatedness of a hearing loss case

Steps	Evidence to consider	OHC responsibility	PS responsibility
1. Is the audiometric test valid?	Adequacy of test environment (calibration records etc.) and test results (test-test variability, etc.); earcanal obstruction. Is shift permanent not temporary; evidence of malingering.	Perform retest and otoscopy if indicated, supply records of calibration, etc. to PS.	Review records, make final determination of validity.
2. Is the employee exposed to potentially damaging noise (or ototoxic chemicals) at work?	Records of industrial hygiene testing for noise and chemicals; preferably results of personal sampling for this individual. Records of and reported use of hearing protection: type, frequency (including fit testing, if available).	Assemble records regarding noise exposure as well as exposure to possibly ototoxic chemicals.	Review records, make final determination whether occupational exposures sufficient to cause loss.
3. Is the hearing loss consistent with NIHL, OR is there a medical condition present that can completely explain the loss?	Absolute amount of hearing loss. Audiometric history, audiometric configuration, differential diagnosis, audiological testing, medical history, physical examination.	Provide PS with previous audiograms and audiometric questionnaire results; assist with medical referrals if indicated.	Perform history and physical examination, review testing results, decide on referral.
4. Considering Steps 1-3, did a work exposure either cause or contribute to the hearing loss, or significantly aggravate a pre-existing hearing loss?	All evidence listed above, including non-occupational noise exposures.	None	Reach a clinical opinion of “more probable than not.”

that the employee has been counseled to seek appropriate otological evaluation and treatment if there is a suspicion of a concomitant medical problem.

The final step is for the Professional Supervisor to consider all the evidence accumulated during steps 1-3, and then to decide, on a “more probable than not” basis, whether the hearing loss was related to work exposures. If the previous steps above have been carried out conscientiously, the final determination of work-relatedness can be a fairly straightforward process. Yet, as the clinical vignettes illustrate, the process of recording work-related cases on the OSHA log has implications for all parties involved, and therefore things may become contentious.

In anticipation of this situation, OSHA’s final rule: Recording Criteria for Cases Involving Occupational Hearing Loss 1904.10 (OSHA, 2002) provides an answer to the question, “Are there any special rules for determining whether a hearing-loss case is work-related?” 1904.10(b)(5). *The answer is No. You must use the rules in 1904.5 to determine if the hearing loss is work-related.*

The reference here is to general OSHA guidance regarding the determination of work-relatedness (1904.5 29 CFR). This document states; *“You must consider an injury or illness to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing condition or illness. Work-relatedness is presumed for illnesses and injuries resulting from events or exposures occurring in the work environment, unless an exception in 1904.5(b) (2) specifically applies.”*

These exceptions include a number of possible reasons to not consider an illness or injury work related, most notably: 1904.5(b) (2)

i. The injury or illness involves signs or symptoms that surface at work but result solely from a non-work-related event or exposure that occurs outside the work environment.

In other words, if a credible case can be made that the hearing loss is due **solely** to non-occupational noise exposure (or a medical

problem), it can be considered non-work related. To make this case, one must be able to convincingly demonstrate that noise exposures at work were insufficient to have contributed to the loss. OSHA appears to allow for such a determination, on a case-by-case basis. Ideally, this issue should have been addressed during Steps 2 and 3 outlined above.

The process of making work-relatedness determinations is therefore where the “rubber meets the road” in a hearing conservation program. While the bulk of the responsibility falls on the Professional Supervisor, it tests the resolve of all members of the hearing conservation team to keep the priorities of the program in mind. The point of doing surveillance audiometry on noise-exposed workers, after all, is to accurately detect cases of hearing loss that indicate that noise controls and other protective measures are not working. This information is vital to the ongoing quality improvement of an effective hearing conservation program.

continued on page 10

UPCOMING OHC CERTIFICATION AND RECERTIFICATION COURSES* 2005 + 2006

*The listed dates indicate day one of the scheduled classes; certification courses are 20 hours in length; recertification classes are 8 hours.

**Current as of October 2005 (for a complete list of courses visit our website at www.caohc.org);
for the most current list of courses contact the CAOHC office at 414/276-5338.**

Begin Date	State	City	Course Director	Phone	Begin Date	State	City	Course Director	Phone
11/16/2005	MA	Auburn	Steven R. Fournier	508-832-8484	12/14/2005	TX	San Antonio	John H. Elmore	800-357-5759
11/16/2005	OH	Dayton	Chris M. Pavlakos	937-436-1161	12/14/2005	FL	W. Palm Beach	Herbert J. Greenberg	678-352-0312
11/16/2005	OH	Cleveland	Carol J. Snyderwine	216-491-6104	01/04/2006	IL	Rockford	Charles A. Russell	770-754-4415
11/17/2005	PA	Pittsburgh	Roger M. Angelelli	412-831-0430	01/11/2006	MA	Auburn	Steven R. Fournier	508-832-8484
11/18/2005	NV	Las Vegas	John H. Elmore	800-357-5759	01/18/2006	WI	Brookfield	Edward W. Korabic	262-547-2227
11/30/2005	IL	Oak Park	Robert C. Beiter	708-445-7171	01/18/2006	NY	Amherst	David Todd Nelson	716-633-7210
11/30/2005	WA	Bellevue	Mary M. McDaniel	206-706-7352	01/25/2006	CA	Concord	Charles E. Fankhauser	707-746-6334
11/30/2005	WI	Green Bay	Paul F. Kurland	920-499-6366	02/08/2006	MA	Auburn	Steven R. Fournier	508-832-8484
11/30/2005	OH	Columbus	James J. Jerome	317-841-9829	02/08/2006	FL	Jacksonville	Nancy N. Green	904-880-1710
11/30/2005	NC	Greensboro	Cheryl S. Nadeau	336-834-8775	02/28/2006	WA	Bellevue	Mary M. McDaniel	206-706-7352
11/30/2005	GA	Atlanta	William K. Wolfe	770-475-2055	03/01/2006	CO	Greeley	Laurie Wells	970-593-6339
11/30/2005	TX	Dallas/Ft Worth	John H. Elmore	800-357-5759	03/08/2006	IA	Iowa City	Laura Kauth	563-355-7712
12/01/2005	NJ	Piscataway	Ellen J. Kelly	732-238-1664	03/21/2006	MA	Auburn	Steven R. Fournier	508-832-8484
12/05/2005	NJ	Piscataway	Ellen J. Kelly	732-238-1664	03/22/2006	WI	Brookfield	Edward W. Korabic	262-547-2227
12/06/2005	MA	Auburn	Steven R. Fournier	508-832-8484	03/23/2006	PA	Pittsburgh	Roger M. Angelelli	412-831-0430
12/06/2005	MA	Marlborough	Pamela J. Gordon	860-526-8686	03/24/2006	SC	Charleston	Stuart L. Cohen	843-797-0275
12/07/2005	TX	Houston	John H. Elmore	800-357-5759	05/31/2006	WA	Bellevue	Mary M. McDaniel	206-706-7352
12/07/2005	IL	Chicago/Schaumburg	Thomas D. Thunder	847-359-1068	06/08/2006	PA	Pittsburgh	Roger M. Angelelli	412-831-0430
12/07/2005	AL	Birmingham	Georgia W. Holmes	205-934-7184	06/21/2006	NY	Amherst	David Todd Nelson	716-633-7210
12/07/2005	TN	Chattanooga	Melette L. Meloy	678-363-9897	07/11/2006	IL	Rockford	Charles A. Russell	770-754-4415
12/07/2005	OH	Cincinnati	Timothy A. Swisher	412-367-8690	07/12/2006	WI	Brookfield	Edward W. Korabic	262-547-2227
12/07/2005	IL	Chicago/Schaumburg	Thomas D. Thunder	847-359-1068	08/09/2006	FL	Jacksonville	Nancy N. Green	904-880-1710
12/07/2005	OR	Aloha	Michael Fairchild	503-259-2686	09/05/2006	WA	Bellevue	Mary M. McDaniel	206-706-7352
12/07/2005	LA	New Orleans	Michael F. Seidemann	504-443-5670	09/13/2006	CO	Greeley	Laurie Wells, MS	970-593-6339
12/08/2005	MO	St. Louis	Mary E. Aubuchon	314-747-5800	09/14/2006	PA	Pittsburgh	Roger M. Angelelli	412-831-0430
12/08/2005	AL	Birmingham	Georgia W. Holmes	205-934-7184	10/04/2006	WI	Brookfield	Edward W. Korabic	262-547-2227
12/08/2005	NC	Greensboro	George R. Cook, Jr.	336-834-8775	11/16/2006	PA	Pittsburgh	Roger M. Angelelli	412-831-0430
12/09/2005	NC	Morrisville	Thomas H. Cameron	919-657-7500	11/29/2006	WA	Bellevue	Mary M. McDaniel	206-706-7352

Hearing loss is work related – continued from page 9

References:

American College of Occupational and Environmental Medicine (2003). "ACOEM evidence-based statement: noise-induced hearing loss," *J. Occup. Environ. Med.*, 45(6), 579-81.

Berger, E.H., Franks, J. R., Behar, A., Casali, J.G., Dixon-Ernst, C., Kieper, R.W., Merry, C.J., Mozo, B.T., Nixon, C.W., Ohlin, D., Royster, J.D., Royster, L.H. (1998). "Development of a new standard laboratory protocol for estimating the field attenuation of hearing protection devices, Part III. The validity of using subject-fit data," *J. Acoust. Soc. Am.*, 103(2), 665-72.

CAOHC (2003a). "Scope of Practice: The Professional Supervisor of the Audiometric Monitoring Program," retrieved 9/28/2005, from <http://www.caohc.org/professionalsupervisor.html>

CAOHC (2003b). "CAOHC Certified Occupational Hearing Conservationist Scope of Practice and Limitations," retrieved 9/28/2005, from <http://www.caohc.org/scopeofpractice.html>

CAOHC (2002). "Hard to Test Workers." *J. Hearing Conservation Manual*, 4th ed. (p 189), Milwaukee, WI.

Dobie, R. (2001) (2nd ed.), *Medical-Legal Evaluation of Hearing Loss*, Singular, San Diego, CA, 398.

Morata, T. (2003). "Chemical Exposure as a Risk Factor for Hearing Loss," *J. Occup. Environ. Med.* 45(7), 676-682.

OSHA (2002). "Occupational Injury and Illness Recording and Reporting Requirements-Final Rule," U.S. Department of Labor, Occupational Safety and Health Administration, *Federal Register*, 44037-44048.

Peter M. Rabinowitz, MD MPH is Associate Professor of Medicine at the Yale University School of Medicine in New Haven, CT, and Director of Clinical Services for the Yale Occupational and Environmental Medicine Program. Dr. Rabinowitz is actively engaged in research related to noise-induced hearing loss, and has published articles related to factors affecting the use of hearing protection, and metrics to track hearing loss in industrial workforces. He may be contacted at: Peter.Rabinowitz@yale.edu

OHC Spotlight and YOU!

We hope you enjoyed reading about Angela Roberts-Khandwala in the "OHC Spotlight" on page 3 of this issue. We think it's interesting to read how OHCs, like you, are applying their knowledge and skills in diverse workplaces.

If you would like to be considered by the editorial staff for a future "OHC Spotlight" feature, please contact Barbara Lechner at the CAOHC office by e-mail: info@caohc.org or by phoning 414/276-5338.

Gulf-Coast OHC & CD certification extension

In joining with other American organizations following the disaster created by Hurricane Katrina in August 2005, CAOHC will grant extensions of up to twelve months for OHCs or CDs who resided in Alabama, Louisiana or Mississippi at that time. In order to receive this extension, if possible, please complete the request form to receive this extension. The form is located on CAOHC's website homepage www.caohc.org (see the streaming headline at the top of that page) or by contacting the CAOHC office. In addition, if you resided in the areas ravaged by the hurricane and need a replacement of your CAOHC certification and/or wallet ID card, contact the CAOHC office at: info@caohc.org or phone 414/276-5338.

Course Director Recertification requirements revised – effective fall 2006

CAOHC certified Course Directors were notified earlier this year that all CDs will be required to recertify by completing a CD Workshop. These workshops will focus on teaching techniques (including practicum) and resources. The CD workshop curricula is being fully reviewed and modified by Council instructors to develop a positive and productive continuing education experience for even the most experienced of CDs.

This requirement will become effective October 2006. CD workshops will be held twice annually: in the early spring of each year – planned to be timed with the National Hearing Conservation Association (NHCA) conference; and on the Friday following the annual CAOHC Council meeting in the Chicago, Illinois O'Hare airport area. An application form and fee is required. (Instructions and forms are available on the web at www.caohc.com.)

National Hearing Conservation Association 31st Annual Hearing Conservation Conference

**NATIONAL HEARING
CONSERVATION ASSOCIATION**

**31ST Annual Hearing
Conservation Conference**

**Hear the Waves
Tampa**

February 16-18, 2006

Hyatt Regency Tampa

NHCA

Plan to come early and stay late. Wednesday (Feb. 15) activities include the NHCA Foundation golf tourney and opportunities for HEAR Trak and other groups to meet. You are sure to find a workshop or two that you won't want to miss. Featured Workshops include: "Bettering your Business for Professional Service Organizations" and "Field Verification of Hearing Protection Devices"

Friday and Saturday will be busy with the core conference and Friday night event. Presentations on hearing protection include, "Effect of training modality on earplug attenuation," "Estimating noise-induced permanent threshold shift from audiometric shape," and "A high-tech hearing protector to maximize attenuation and speech understanding." Other topics will meet the needs of all levels and areas of hearing conservation issues. On the lighter side, (possibly of greatest interest!) our Friday luncheon speaker, Dr. David Yager, will enlighten us to the world of "Insect Hearing".

CAOHC is presenting a Course Director Workshop on Sunday, Feb. 19, 2006 so that you can take advantage of one trip to get all the hearing conservation training that can be fit into a 5-day period.

Call the NHCA office at 303.224.9022 for additional information or visit the website at www.hearingconservation.org. Make your hotel reservations at the Hyatt Regency Tampa by calling 1.813.225.1234 or 1.800.233.1234 – be sure to ask for the NHCA 2006 Conference rate. See you in Tampa!

CAOHC Council Members and The Organizations They Represent

Chair

Richard W. Danielson, PhD

American Academy of Audiology
Baylor College of Medicine and National
Space Biomedical Research Institute (NSBRI)
NASA Johnson Space Center
Houston TX

Vice Chair

Mary M. McDaniel, MS CCC-A

*American Speech-Language-Hearing
Association*
Pacific Hearing Conservation, Inc.
Seattle, WA

Secretary/Treasurer

James D. Banach, MBA

American Industrial Hygiene Association
Quest Technologies & Metrasonics, Inc.
Oconomowoc, WI

Immediate Past Chair

Theresa Y. Schulz, PhD

James H. Quillen VA Med. Center
Mountain Home, TN

Elliott H. Berger, MS INCE. Bd.Cert.

American Industrial Hygiene Association
E•A•R/Aearo Company
Indianapolis, IN

Paul J. Brownson, MD FACOEM FAAFP

*American College of Occupational &
Environmental-Medicine*
The Dow Chemical Company
Indianapolis, IN

Robert D. Bruce, PE INCE. Bd.Cert.

Institute of Noise Control Engineering, Inc.
Collaboration in Science and Technology, Inc.
Houston, TX 77084-5131

Diane S. DeGaetano, RN, BSN, OHC, COHN-S

*American Association of Occupational
Health Nurses*
Merial, Ltd.
Duluth, GA

John H. Elmore, AuD MBA

American Society of Safety Engineers
Precision Hearing Conservation
Helotes, TX

Donald Henderson PhD

American Speech-Language-Hearing Association
Center for Hearing & Deafness
State University of New York
Buffalo, NY

Thomas L. Hutchison, MHA FAAA CCC-A

Military Audiology Association
Naval Ambulatory Care Center
Portsmouth, NH

Madeleine J. Kerr, PhD, RN

*American Association of Occupational
Health Nurses*
Univ. of MN/School of Nursing
Minneapolis, MN

J. Adin Mann, III, PhD

Institute of Noise Control Engineering
Iowa State University
Ames, IA

Peter M. Rabinowitz, MD MPH

*American College of Occupational &
Environmental Medicine*
Yale Occupational & Environmental Medicine
Program
New Haven, CT

Ronald D. Schaible, CIH CSP PE(Mass)

American Society of Safety Engineers
Robson Lapina, Inc.
Lancaster, PA

Mark R. Stephenson, PhD

American Academy of Audiology
CDC/NIOSH
Cincinnati, OH

Vickie L. Tuten, AuD CCC-A

Military Audiology Association
US Army Preventive Medicine
Fort Bragg, NC

Peter C. Weber, MD MBA FACS

American Academy of Otolaryngology
- Head & Neck Surgery
The Cleveland Clinic Foundation
Cleveland, OH

Stephen J. Wetmore, MD, MBA

American Academy of Otolaryngology
- Head & Neck Surgery
R.C. Byrd Health Science/WVA Univ.
Morgantown, WV

79-0905-001

Fall 2005



Council for Accreditation in
Occupational Hearing Conservation
555 East Wells Street / Suite 1100
Milwaukee, WI 53202-3823

Address Service Requested



www.caohc.org
or e-mail our office
at info@caohc.org

PRSR STD
U.S. POSTAGE
PAID
MILWAUKEE, WI
PERMIT NO. 5438