



UPDATE



Antioxidants – Good for Your Health, Good For Your Hearing

By Richard D. Kopke, MD and Richard W. Danielson, PhD

If you've been diligently working in hearing conservation for a few years, you probably have your customary way of describing the biological effects of noise on the hearing system, based on what you were originally taught. Traditionally, we have used ominous words like "permanent", "irreparable" and "irreversible" to try to convince skeptical workers that they ought to heed our recommendations for hearing conservation practices. As Occupational Hearing Conservationists (OHCs), you've had your work cut out for you...especially if determined workers doubt your point of view or training. One day, one of these workers might even say, "Hey, I read that they have some medicine now that can prevent harmful effects of noise on the ear." Although such a remedy is not available now from your pharmacy, you should know that there have been some landmark discoveries in auditory research about how the cochlea is injured during excessive noise exposure and how it may sometime be possible to reverse or prevent acute noise damage with medications. This article will summarize some of this research and recommend further reading for OHCs who may be interested in this fast-paced research activity.

When the cochlea is exposed to loud noise, damage occurs that can be classified as either mechanical (e.g., tearing apart the delicate tissue structures when loud blasts occur above 125 - 130 dB SPL) or metabolic exhaustion (far less traumatic, but more common, habitual noise exposures). Metabolic exhaustion occurs when toxic waste products known as **free radicals** or **reactive oxygen species (ROS)** are formed after the cells in the cochlea are stressed by reductions in cochlear blood flow, excessive and toxic levels of neurotransmitters like glutamate, changes in calcium balances in the cell, and other stress-related changes that are induced by noise. These free radicals, or ROS, injure a wide variety of critical structures in the cochlea, causing cell damage and cell death that are the effects we classically illustrate in our hearing conservation lectures. What's new to the picture, though, is the idea that our body can react to a brutal stress like noise trauma by presenting a defense of **antioxidant** enzymes and other molecules. **Figure 1** shows a sequence of events that depict how the cochlea's stress can ultimately cause its death, summarizing studies from several labs [see Kopke, 2002].

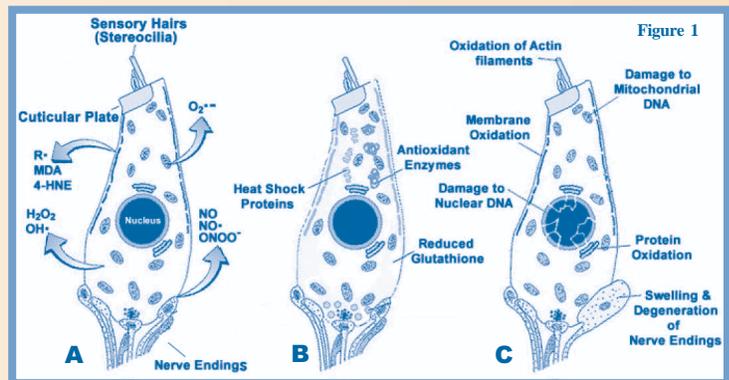


Figure 1: Noise-Induced Oxidative Cochlear Injury. **A:** Four main forms of reactive oxygen species (ROS) produced by hair cells undergoing oxidative stress. Acoustic trauma causes the stereocilia to prompt the hair cell to generate ROS, which can kill the cell. **B:** Main antioxidant defenses available to a hair cell that may control oxidative damage from ROS (see text). These defense mechanisms work by directly blocking the creation of ROS or by removing the ROS from the cell before it can damage the nucleus or other important cellular structures. **C:** Forms of cell damage and injury caused by ROS when the damage exceeds capability of antioxidant defenses. These forms of cell damage and injury often result in cell death.

Figure 1A shows how over stimulation of the hair cell prompts excessive generation of free radicals (indicated by their chemical abbreviations). In response, cochlear defenses take place [like production of antioxidant enzymes, antioxidant molecules or production of glutathione (GSH), and other factors (as shown in **Figure 1B**)]. Finally, when these antioxidant defenses are overwhelmed, the hair cell is subject to serious damage to its nuclear DNA, mitochondria, and membranes (as depicted in **Figure 1C**). When hair cells are damaged in this way, they are prone to a genetically programmed cell death sequence (known as **apoptosis**), in which the ongoing

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CAOHC Approved OHC 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. 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 HAPPY ANNIVERSARY!



By Theresa Y. Schulz, PhD
Representative of the Military Audiology Association

Did you know that this year is CAOHC's 30th anniversary? Pardon the cliché but we've come a long way, baby! And we're continuing to move along at an amazing pace. Your Council and our Executive office are always busy with projects to improve our support to you as Occupational Hearing Conservationists (OHCs) and Course Directors (CDs) and to ensure credibility and value to our credentialing process. There are currently over 22,000 certified OHCs and 350 CDs. Over 6,000 students attend one of the approximately 500 certification/recertification courses annually.

CAOHC was created to fill the need for guidelines and standards in the occupational hearing conservation field. In February of 1973, the organization that set the standards and established training policies and methods for providing industry with technicians who conduct quality hearing conservation programs in large and small industries was renamed the "Council for Accreditation in Occupational Hearing Conservation." For more information on the rich history that led to that change see UPDATE, Spring 1998, 9(1), 3. The Mission of CAOHC is to promote the conservation of hearing by enhancing the quality of occupational hearing conservation programs.

Each Course Director is affiliated with at least one of the Component Professional organizations (CPOs) represented by two volunteers on the Council. The Council's mix of disciplines was felt to be the best manner in which to assure that reasonable and effective guidelines would be developed and used. The current CPOs and their representatives are listed in every UPDATE issue on the outside back cover.

Since its inception, CAOHC has been involved with a number of governmental agencies including the OSHA, MSHA, EPA, and NIOSH. We've partnered with other organizations as a member of the Coalition to Protect Worker's Hearing providing expertise and advocating for appropriate regulatory changes.

CAOHC has authorized a number of publications over the years including the first *Occupational Hearing Conservationist Manual* in 1978. The manual was rewritten in 1993 and again in 2003 under the title *Hearing Conservation Manual, fourth edition*. Although the Manual is designed to be used by CAOHC CDs in teaching their courses and by OHCs as a reference tool, everyone involved in hearing conservation at any level and to any degree will find this manual useful. (An order form is on page 11 of this issue.)

We keep OHCs and CDs informed about evolving hearing conservation issues, not only with the UPDATE newsletter published 3 times a year, but with timely information on our recently redesigned web site (www.caohc.org). The web site is one way to stay connected. You'll find lists of upcoming CAOHC courses, ways for OHCs and CDs to market themselves, forms and supplemental materials for certification/recertification courses and much more! (You'll find more information about our website redesign on page 7.)

CAOHC has changed a great deal in its 30 years. We continue to grow not only in numbers but we intend to maintain a level of quality so that OHCs will be proud of their accreditation. So when you think of CAOHC, think not only of its rich history and what its done for you lately but what we can continue to do to ensure the high standards that have become synonymous with CAOHC.



Amendments to OSHA's Final Rule for Recording Occupational Hearing Loss

By Susan C. Megerson, MA CCC-A
The University of Kansas
Intercampus Program in Communicative Disorders

In the last issue of CAOHC's *UPDATE*, I provided a summary of OSHA's new rule for recording occupational hearing loss on the Form 300 Log of Work-Related Injuries and Illnesses (Megerson, 2002). This rule, 1904.10, was finalized July 1, 2002 with an effective date of January 1, 2003. It requires that employers record work-related cases of Standard Threshold Shift (STS), but only when the employee also shows an overall hearing level outside the normal range (OSHA, 2002a). At the time the final rule was released, OSHA also announced that it was delaying the requirement for, and seeking further comment on, a separate hearing loss column on the Form 300 (OSHA, 2002b).

With only a few weeks remaining before the effective date, OSHA released its final decision on a separate column for recording hearing loss and also amended some of the provisions of 1904.10 as initially published in July. This amendment to the final rule appeared in the December 17, 2002 *Federal Register* (OSHA, 2002d), preceded by a Trade Press Release issued December 16, 2002 (OSHA, 2002c). [Editor's note: see the OSHA "box" on the CAOHC website at www.caohc.org.] Following are highlights:

Separate Column: After reviewing comments of interested parties, OSHA has decided to retain the hearing loss column requirements of 1904.10 with an effective date of January 1, 2004. OSHA expects the separate column to facilitate analysis of hearing loss data at individual workplaces and to improve the Agency's ability to track and assess occupational hearing loss and to prioritize hearing loss prevention efforts. In the interim, during 2003, employers are expected to record cases of occupational hearing loss on the Form 300 as follows: as an "injury" [column (m)(1)] if due to a single event/acoustic trauma or "other illness" [column (m)(5)] if due to long term noise exposure.

Baseline/reference audiogram: The most significant change to 1904.10 published in December 2002, is the modification of OSHA's definition of "revised baseline" for hearing loss recording purposes. In the final rule issued July 2002, OSHA defined revised baseline as "the audiogram reflecting the employee's previous recordable hearing loss case." This requirement was problematic in that it would have required employers to track separate baselines for each employee: revised baselines for hearing conservation purposes and revised baselines for recordability purposes. In order to simplify the process, OSHA now defines revised baseline according to existing definitions provided in the noise standard 1910.95. This modification allows companies to track both hearing conservation program STS and recordable STS/hearing loss cases using the same baseline audiogram.

Applicable industries: OSHA clarified an error that appeared in the July 2002 final rule: the shipbuilding industry was incorrectly indicated to be exempt from OSHA's noise standard 1910.95, which it is not.

Trend analysis: Lastly, in response to employer concerns regarding an increase in the number of reported hearing loss cases beginning in 2003, OSHA issued a note of caution. It is recognized that the data captured in 2003 and future years will not be comparable to prior years when less stringent hearing loss criteria may have been used.

As a reminder, each potentially recordable shift that meets the specified OSHA criterion should receive careful review by an audiologist or physician knowledgeable in the effects of noise and in hearing conservation programs. See **Table 1** for an example protocol for processing potentially recordable cases under the new final rule, and of course, check with your audiometric program professional supervisor for further guidance.

Table 1: Example Protocol for Determining STS Recordability*

(If at any step a "no" is encountered, the process ends and the hearing change is **not** recorded on Form 300)

- **Step 1:** Compared to the baseline or revised baseline audiogram as defined by 1910.95, is there an STS in either ear (age adjustments allowed)? If yes, continue to step 2:
- **Step 2:** Is the average hearing level on the current hearing test at 2000, 3000, and 4000 Hz in the same ear greater than or equal to 25 dB HL (no age adjustments allowed)? If yes, continue to step 3:
- **Step 3:** Is the STS confirmed upon 30-day retest (or was a retest not conducted)? If yes, continue to step 4:
- **Step 4:** Has a qualified health care professional determined that the shift in hearing is more likely than not work-related? If yes, continue to step 5:
- **Step 5:** Record the case on Form 300 within 7 days of retest (or within 37 days of test if a retest was not conducted).

*revised from Megerson (2002) to include OSHA supplementary information issued 12/17/2002

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OSHA (2002c). OSHA Recordkeeping Form to Include Hearing Loss in 2004, Occup. Safety and Health Admin., Trade News Release, December 16, 2002.

OSHA (2002d). Occupational Injury and Illness Recordkeeping and Reporting Requirements; Supplementary Information, Occup. Safety and Health Admin., *Federal Register*, Vol. 67, No. 242, 77165-77170, December 17, 2002.

Susan Megerson is an instructor for the University of Kansas Intercampus Program in Communicative Disorders. She has been a CAOHC-certified Course Director since 1984 and has served on the CAOHC Council, including a term as Chair.

When the OHC Goes Home ... What Next?

The OHC's Guide to Establishing an Effective Hearing Conservation Program

Beth A. Cooper, PE INCE. Bd.Cert.

Representative on the CAOHC Council for the Institute of Noise Control Engineering



Part 1 in a series of 3: Defining an Appropriate Role for the OHC

As an OHC, you belong to a multidisciplinary team of professionals, each of whom is responsible for a different facet of the hearing conservation program. While some hearing conservation functions require specific skills, credentials, or education, there are many that may be assigned to any member of the team, particularly to those who have attended a 20-hour CAOHC-approved course. Roles for each team member may be crafted to accommodate the skill mix on the team and the amount of time each member is able to devote to hearing conservation. Your own personal role will depend as much on the composition of the team as on your educational background and other job duties.

This series of articles will discuss some of the responsibilities that may be assumed by *any* OHC who has attended a CAOHC-approved course, regardless of prior experience and educational background. By combining as many of these responsibilities as is practical into a single role, the OHC can become a visible and effective focal point of the program, even managing the efforts of those team members who perform the specialized functions for which specific skills or credentials are required. There is no educational or experience prerequisite for managing a hearing conservation program, so an OHC who is excited about hearing conservation should think about expanding the scope of the job to provide more personal challenge and job satisfaction while providing better service for the program's constituency.

The hearing conservation team

The hearing conservation team will usually include a mix of professionals, depending on the size and nature of the organization and the personnel and financial resources that are available to support the hearing conservation program. At a minimum, the team should include a Professional Supervisor (who must be either an audiologist or a physician), one or more persons who are specifically trained in noise measurement and noise control engineering (such as a noise control engineer, industrial hygienist, or safety engineer) and an audiologist (and often an otolaryngologist) to whom employees may be referred for follow-up when the Professional Supervisor determines that the audiogram indicates the need for further evaluation. Some of these team members may be full-time employees who are devoted to the hearing conservation program, but in most instances they will be part-time resources, some of whom are consultants contracted to provide short-term support as needed.

After meeting these minimum program requirements, the remainder of the program's functions may be assigned to the other team members in any number of ways, depending on the size of the team and pragmatic considerations such as individual workload, relevant educational background, and personal strengths. Of course, those team members who are involved in the audiometric monitoring program should have attended a CAOHC-approved course and obtained CAOHC certification. Although it is not absolutely necessary for all members of the team (other than those who are conducting audiometric testing) to be CAOHC-certified or to have attended a CAOHC-approved course, a uniform level of training will ensure consistent and high-quality delivery of services and reduce the likelihood of conflicts between the various elements of the program.



Implementing an effective hearing conservation program is a team effort.

An appropriate role for the OHC

Often, the CAOHC-trained OHC (who may assume, either intentionally or by default, many of the remaining program functions in addition to audiometric testing) is the only full-time or nearly full-time team member, and sometimes he or she may be the only one who is located on-site. In many cases, the involvement of the other team members revolves around this OHC and is activated and coordinated by the OHC, who then functions as the Hearing Conservation Program Manager.

Although CAOHC training will prepare the OHC to take an active role in many areas of the hearing conservation program, there are some limitations that should be observed by the OHC and his/her management when defining the OHC's role. First, although the OHC may function as the manager of the overall hearing conservation program, the *audiometric monitoring* portion of the program must have an



What We Do To Ourselves: Noise Exposures Beyond Noisy Work

By James Banach, MBA
Representative on the CAOHC Council for the American Industrial Hygiene Association

We've all been there. Stopped at a traffic light, as you try to concentrate on a thought or listen to something on your own radio, you realize that your world is being attacked by a thump...thump...thump. It is the sound of a car stereo blasting out bass signals. They sound tinny, since the speakers are exceeding their intended use. You look in the mirrors, and at the car next to yours, and there is the kid, with the windows open, sharing with all the world incredibly loud and annoying music. This isn't a factory, or a construction site, but the noise is no less extreme. What are we doing to ourselves?

Workplace exposures are well documented. Numerous papers present the sound levels that exist in paper mills, textile plants, canneries and foundries. But what about the exposures of those who do not have noisy occupations? We should understand what exposures are faced in non-noisy jobs and our current technological world so we can better understand what goes on in the sound intense workplace.

In a 1994 study by Berger and Kieper, the exposure results of 20 individuals, each measured for 7 days for 24 hours, were reported. By utilizing a 7-day, 24-hour approach, work, sleep, hobbies, home tasks, and social activities were included. This study found an equivalent daily exposure (L_{eq}) of 78 dBA, however this group of 20 included four individuals who had moderately noisy occupations. When these four samples were removed, the overall exposure for the remaining group dropped to an L_{eq} of 77 dBA.

In a follow on to this study, a series of 20 more samples were completed in 2002 by this author. The same procedure was followed as in the Berger and Kieper study, using a 3-dB exchange rate, and no threshold. All those sampled have occupations with low levels of noise, as indicated by not having to raise your voice to be heard over background levels. Occupations included engineers, clerical staff, electronic technicians, and business managers. This series of samples resulted in an L_{eq} of 74 dBA.

One other study by Schori and McGatha in 1978 monitored 50 individuals in much the same manner. This study found an L_{eq} of 74 dBA when the exposures of one group of 10 children are removed from the sample. When the children were included, the level rose to 76 dB.

From the Schori and McGatha study, and one done by Clark published in 1994, it appears kids have a noisier daily experience than their adult counterparts. Clark's study found an average level of 87 dBA over a group of 110 children. Another study by Siervogel in 1982 assessing a group of 127 children resulted in an 80-dBA L_{eq} .

While we have plenty of sound interruptions around the house, from appliances, power tools, and entertainment systems, our leisure activities provide plenty of input. Whether we

choose the movies, a sporting event, or a truck rally, recent samples show we like our auditory senses stimulated as part of the "relaxation."

To get a better idea of the source of the relatively high daily values for the "non-occupationally" noise-exposed samples reported above, read on for some specific examples.

Berger has collected 24 movie samples at a variety of theaters for productions as gentle as "Chocolat" to action-packed experiences like "Pearl Harbor" and "Exit Wounds." The average sound levels ranged from 72 dBA to 86 dBA. Across the range of movies and theatres, the average sound level was 78 dBA. This author sampled "Armageddon," and found an average level of 84 dBA. Thankfully, at least for our ears, these exposures typically last less than 3 hours.

Sporting events provide a lot more bang for the buck if our leisure goal is to exercise the ears. In a [Washington Post](#) article, a study performed by Ron Pearlman is reviewed. The game was a Redskins vs. Giants game from December of 2000. Fireworks, fans, and football resulted in an average sound level of 89 dBA over a 3 hour and twenty minute period. During high points of the game, peak levels of between 135 and 143 dBA were experienced. Berger has recorded even higher football exposures in Indianapolis with a 3-hour L_{eq} of 97 dBA for a game in which the home team (the Colts) lost.

Not to be outdone by the NFL, a Milwaukee Bucks NBA game also provided an 89-dBA average level. Peak levels experienced reached 131 dBA. The only respite for the ears during this game happened just before the opening tip, during the National Anthem, and again at the half. The remainder of the game stayed above 80 dBA consistently. For both the Redskins and the Bucks, these were games that were lost—imagine if the fans would have really had something to cheer about.

Football and basketball provide plenty of acoustic energy, but can't stand up to a monster truck rally. A rally in Milwaukee provided plenty of ear-splitting action, with the average level at just over 90 dBA and a concluding finale peak level of 146 dBA. Now that is real entertainment.

After bombing the ears with these entertainment options, perhaps you'd like to settle back and spend a quiet day doing some yard work, or maybe it is time to take a trip to get away from it all. Samples show these might not be the best choices either.

In a daylong sampling of lawn cutting, hedge trimming, leaf blowing, and such, an L_{eq} of 96 dBA resulted. This even included a quiet break for lunch. A little more than 10% of the time was spent at levels exceeding 100 dB and over half the 7-hour and 47-minute period was over 85 dBA.

So let's get away from it all, board a plane and head somewhere to relax. Well a 1-hour and 40-minute flight on a DC 9 provided an L_{eq} of just less than 83 dBA. Some of this rest makes staying at work sound like a good idea.

OHC Goes Home

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acknowledged Professional Supervisor who is either an audiologist or physician. The Professional Supervisor and the Hearing Conservation Program Manager work together, and their roles are complementary. Defining and understanding these two roles and their intended relationship is a critical step in the establishment of an effective hearing conservation program. This topic will be discussed further in the next installment of this series.

Elements of an effective hearing conservation program

A successful hearing conservation program is a multidisciplinary and multifaceted enterprise. By design, it cannot be completely and effectively (or legally, for that matter) maintained without the involvement of at least three people, as discussed above. By necessity, it often involves far more than these three or more specialists, whose contributions, while critically important, account for only a small percentage of the total program workload. The remaining program responsibilities may be divided up among the remaining team members in accordance with all of the factors that influence the organization's staffing decisions.

The elements of an effective hearing conservation program are:

- Audiometric testing
- Selection, provision and fitting of personal hearing protection
- Employee and management training
- Program administration and management
- *Audiogram review, referral, and follow-up*
- *Area noise monitoring and personal dosimetry*
- *Noise control engineering*

With the exception of the italicized elements above (which require additional specialized training), the other functions provide ample opportunities for the CAOHC-trained OHC and any other team members. Future installments in this series of articles will discuss selected program elements in detail and provide suggestions on how they may be effectively implemented in the context of the overall program. Particular emphasis will be placed on defining an appropriate role for the OHC in each area and on how the OHC may combine some or all of these responsibilities into an effective and comprehensive program management position.

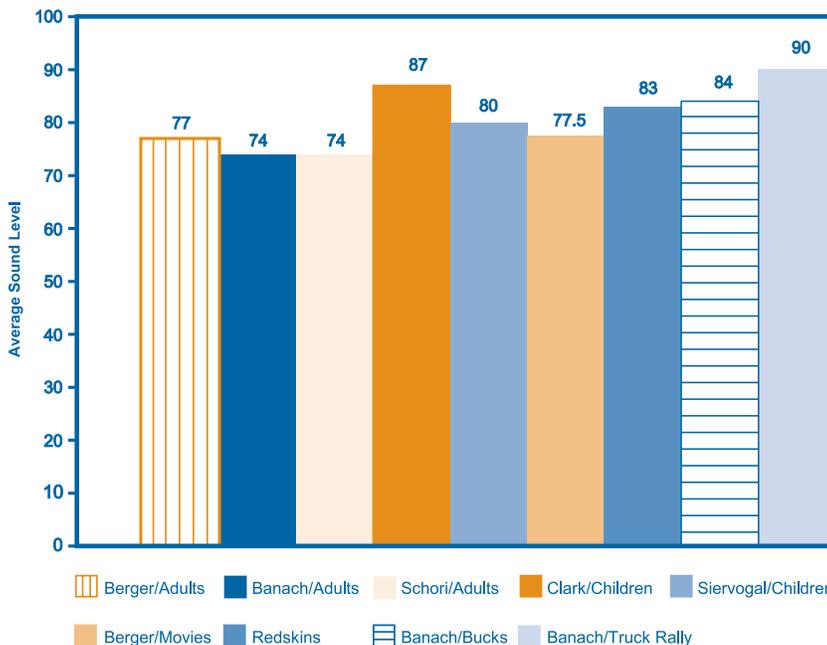
Beth Cooper is an acoustical engineer and Manager of Acoustical Testing Services at the NASA John H. Glenn Research Center at Lewis Field, where she provides noise control engineering support to help Glenn Research Center's science experiment payloads meet International Space Station hearing conservation goals.

Noise Exposures . . .

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To be sure, we find quiet times and not every non-occupational or non-noisy occupational experience is a loud one. Yet there is a growing set of information that suggests we need to give the "quiet" world a serious look. More sampling is needed to get a better perspective on exposures beyond OSHA- or MSHA-regulated workplaces.

To put it all in perspective, it is worth recalling that in the now classic U.S. Environmental Protection Agency (EPA) Levels Document, scientists estimated that in order to protect virtually the entire population ("with an adequate margin of safety") from any significant noise-induced permanent threshold shift (i.e., ≤ 5 dB at 4 kHz) exposures would have to be limited to levels not exceeding an $L_{eq}(24)$ of 70 dB. So perhaps indeed, our non-occupational age-related hearing loss isn't all just due to the aging of the organism.



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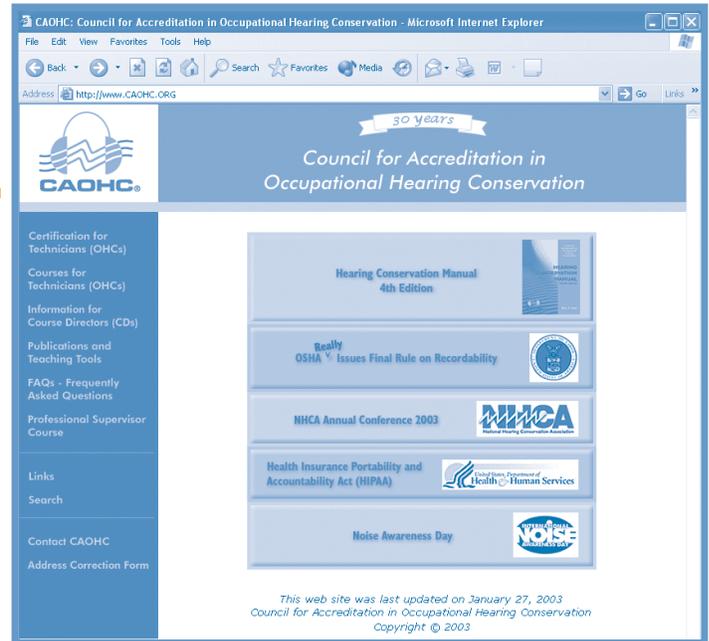
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Mr. Banach has been a member of the Quest Technologies management team since 1984, he is currently the Vice-President of Operations and CIO. He is past-president of the National Hearing Conservation Association (NHCA), and past-chair of the American Industrial Hygiene Association's Noise Committee (AIHA).

CAOHC WEBSITE UPGRADED

We invite you to visit our newly upgraded website at www.caohc.org. You'll find it easier to navigate and we've added search boxes to assist you in your browsing. The sites of specific interest to Occupational Hearing Technicians are now headlined as "Certification for Technicians (OHCs)." You'll find OHC courses and Course Director Locator under their own menu selection. We will continue to add to our "FAQs – Frequently Asked Questions" section and previously printed articles from the UPDATE newsletter can be found at "Publications and Teaching Tools."

If you have suggestions or comments about the new site, please contact the CAOHC office via e-mail at info@caohc.org



Fall 2002 Semi-Annual Council Meeting

The Council met on October 17, 2002 in Rosemont, Illinois at the Embassy Suites Hotel O'Hare. The various CAOHC committees reported activities that have been planned and/or completed since the last meeting, received an update from the Executive office staff about the certification process and other business matters, and discussed pertinent issues relating to hearing conservation.

Projects of interest announced by the Council include: a request that course directors select from a CAOHC prepared exam question bank for their OHC 20-hour certification courses in 2003; the OHC Committee is developing a "Scope of Practice" statement for OHCs; and the current prescribed curriculum for both the 20-hour and 8-hour OHC courses is being reviewed for possible enhancements in 2004. *[Editor's Note: More information about these efforts will be published in future UPDATES and posted on our website.]*

The Council recognized retiring ASHA representative, Myrna Stephens, PhD CCC-A for five years of service. Stephens had served on several committees and chaired the Education Committee during her tenure. She was a presenter at course director workshops and is a CAOHC Course Director.

Michael Holthouser, MD MPH, a representative for ACOEM was also acknowledged for ten years of service. He served on several committees and was a presenter for the course director workshop and the Professional Supervisors course held at the American Occupational Health Conference.

CAOHC EXHIBITING AT AOHC

The annual American Occupational Health Conference (AOHC) will be held in Atlanta, Georgia on May 2-9, 2003 at the Georgia World Congress Center. This joint meeting of the American Association of Occupational Health Nurses (AAOHN) and the American College of Occupational & Environmental Medicine (ACOEM) is the premiere meeting for occupational health nurses, physicians and allied health professionals. Over 4,000 attendees are expected. CAOHC has been exhibiting at this conference for several years and will be there again during the exhibit dates of May 6-8, 2003 at **Booth #854**. Stop by and introduce yourself, we always look forward to meeting you personally.

Spring 2003 Course Director Workshop

The Council will conduct the spring Course Director Workshop on Friday, March 14, 2003 in Atlanta, Georgia at the Embassy Suites Hotel Atlanta - Airport. This workshop is a requirement for Course Director certification upon application approval by the CAOHC Screening Committee.

Course Directors may also choose the workshop method for recertification. All questions may be directed to Barbara Lechner, Executive Director, at 414/276-5338. Application forms are available on-line at www.caohc.org as well as the workshop registration form.

The next CD workshop will be held on October 3, 2003 in Rosemont, Illinois at the Sheraton Gateway Suites O'Hare.

Spring 2003 Council Meeting

The CAOHC Council will hold their semi-annual meeting prior to the Spring Course Director Workshop on Thursday, March 13, 2003 in Atlanta, Georgia at the Embassy Suites Hotel Atlanta - Airport. The Council is comprised of two representatives from each of the Component Professional Organizations assisting CAOHC in meeting its mission (*see back cover for these representatives and their organizations*). The Council meets twice a year to report on the status of committee projects, discuss tactics for carrying out future tasks, and to review the fiscal activities of CAOHC.

Health Nurses Partner with CAOHC AT AOHC

CAOHC will present "Evaluating and Improving the Effectiveness of Your Hearing Conservation Program" at the American Association of Occupational Health Nurses (AAOHN) joint seminar with the American College of Environmental Medicine (ACOEM) at the 2003 American Occupational Health Conference (AOHC) in Atlanta, Georgia. This session scheduled for Monday, May 5, 2003 at the Georgia World Congress Center is designed to assist participants in evaluating their hearing conservation program. Objectives include:

- Describe the components of an effective hearing conservation program to determine whether their program meets requirements.
- Describe ways they can improve key areas of their hearing conservation program including audiometric testing, hearing protection, employee education, recordkeeping, and referral process.
- Discuss selection of members of an effective hearing conservation team.
- Explain how to develop methods for solving problems specific to their programs.

This seminar will be conducted by CAOHC Council members Theresa Schulz, PhD CCC-A and Beth Cooper, PE INCE.Bd.Cert. To register for **Seminar #421** go to the CAOHC web link at: www.caohc.org/conference.html

ACOEM ANNOUNCES POSITION ON NOISE-INDUCED HEARING LOSS



By Paul J. Brownson, MD FACOEM FAAFP
Representative CAOHC Council for ACOEM
and CAOHC Secretary/Treasurer

On November 15, 2002 the American College of Occupational and Environmental Medicine (ACOEM) published a press release announcing that the College has updated its position statement on Noise Induced Hearing Loss (NIHL) in order to promote improved surveillance and encourage research for this condition. The updated guideline was developed by ACOEM's Noise and Hearing Conservation Committee,

International Noise Awareness Day, Wednesday, April 30, 2003

"It is time to address the threat that noise poses to hearing, health, learning and behavior," says Amy Boyle, Director of the Noise Center of the League for the Hard of Hearing. This year the League is once again spearheading a special effort to inform the public of the necessity of creating a quiet home, school and recreational environment. Continuous exposure to noise above 85 decibels can be harmful to hearing and can also lead to physiological changes in and stress-related disorders as well. Studies exist documenting the harmful effects of noise on children's learning and behavior. "It is time" Boyle says, "that we take responsibility to quiet our surroundings and create a healthy environment for us and our children."

Among the many activities planned during **International Noise Awareness Day**, Wednesday, April 30th, sponsored by the League for the Hard of Hearing, the public will be asked to observe the Quiet Diet - one minute of quiet, regardless of their location, from 2:15 P.M. to 2:16 P.M. Other activities planned include:

Free Hearing Screenings
Dissemination of Hearing Protection
Town meetings to "Sound Off on Noise"
Publicity
City/State Proclamations
Community Outreach
Letter Writing Campaign

Additional information on International Noise Awareness Day is available at www.lhh.org/noise or by contacting Amy Boyle via email at aboyle@lhh.org or by mail at: League for the Hard of Hearing, 71 West 23rd Street, New York, NY 10010. Toll Free phone: 888 NOISE 88.

which is chaired by myself, and Peter Rabinowitz, MD, MPH, associate chair and principal author of the update.

The new evidence-based statement identifies characteristics of NIHL and includes a list of clinical considerations that are intended to assist physicians in evaluating cases of possible NIHL. And, because certain aspects of NIHL remain poorly understood, ACOEM proposes the establishment of a research agenda for NIHL to shed light on some of the gaps in the current knowledge.

The statement and press release are posted on the ACOEM web site at www.acoem.org, and the statement will be published in a future issue of the College's peer-reviewed "Journal of Occupational and Environmental Medicine."

ACOEM is an international medical society of more than 6,000 members. Founded in 1916, ACOEM provides leadership to promote optimal health and safety of workers, workplaces, and environments. The College is headquartered in Arlington Heights, IL.

Dr. Brownson is the Corporate Health Coordinator for the Dow Chemical Company in Indianapolis, IN. He serves as Chair of the ACOEM Noise Committee.

Antioxidants

continued from page 1

loss of hair cells can continue for days to weeks after an acute noise insult. In summary, excessive noise stresses the cell, generating some defenses (that may help), but can cause cell death (when overwhelmed).

The “new” perspectives of auditory research, however, indicate that permanent noise-related hearing loss can be reduced with increases in defenses provided by inner-ear antioxidant enzyme activity, inner-ear GSH, or the administering of antioxidant compounds [see Ohinata (2000), Hu et al, (1997), and Henderson et al. (1999)]. In addition, the ear’s vulnerability to noise and toxins in the basal region of the cochlea (known to be critical for high-frequency hearing sensitivity) may be due to a relative weakness of antioxidant defenses (i.e., reduced GSH) in that region (Sha et al., 2001). Research has suggested that GSH is probably the key inner ear antioxidant defense molecule, in both preventing and treating acute noise-induced hearing loss (Kopke et al., 2000, Kopke et al., 2002). GSH is not well absorbed into cells and is degraded by the liver. Therefore, strategies to increase inner-ear GSH levels have been tested using a variety of drugs, which have been already approved by the FDA for other applications. N-acetylcysteine (NAC) and methionine (MET) are two such agents that can be used by the ear to synthesize GSH. NAC can counter the harmful effects of noise on the cochlea by acting as a free radical scavenger and by replenishing GSH. The replenished GSH also detoxifies free radicals, reduces the effects of excessive and toxic effects of glutamate and inhibits programmed cell death.

One of the promising outcomes of basic research has been the indication that NAC and related compounds may greatly reduce noise-induced cochlear hair cell loss, as well as permanent hearing loss, if administered prior to the noise and then for a short period of time after the exposure (Kopke et al., 2000, Kopke et al., 2002). **Figure 2** displays a dramatic reduction in permanent hearing loss achieved when NAC is administered prior to continuous or impulsive noise exposures. In addition, if NAC and related compounds are given shortly after an acute noise injury, research has indicated reduced permanent hearing loss as well.

Since this basic research has been promising in animal studies, the next step in the development of this technology is to perform well-designed human clinical trials in occupational settings where some hearing loss occurs despite the appropriate use of hearing protection devices. Once clinical efficacy is established there are a number of clinical and occupational scenarios where the technology could be employed. For example, in very noise-intensive occupational environments, workers could take NAC during their work shifts in addition to wearing their hearing protection devices. In some military situations (like aircraft carriers), noise levels exceed attenuation capabilities of hearing protection devices and sailors may benefit from use of pharmacological technology. In addition, if we could identify those who are susceptible to noise damage, they might well benefit from such treatments with pharmacological agents. Lastly, since NAC and related agents appear to be effective even if given shortly after a loud noise exposure, those with noise-induced tinnitus could take the medication soon after the insult with a reduction in permanent hearing loss anticipated.

Figure 2

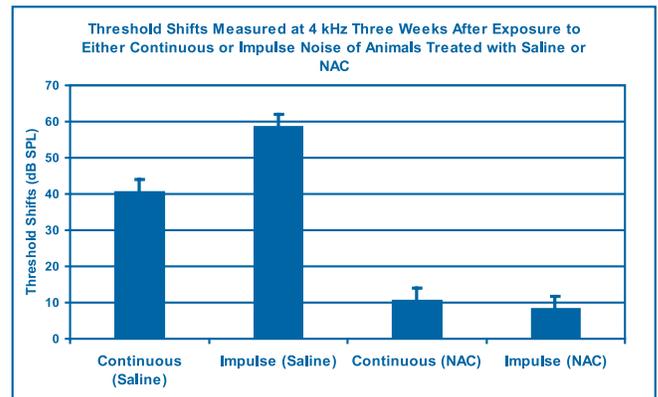


Figure 2: The Effects of Noise on Hearing Thresholds. Three-week post-noise hearing threshold shifts measured on chinchillas (pre-treated with either saline or NAC) after continuous or impulsive noise exposures. Threshold shifts were measured by auditory brainstem response (ABR) at 4 kHz. Post-noise ABRs were compared to baseline, pre-noise exposure ABRs. The threshold shifts after each of the noise exposures was significantly lower for the NAC-treated animals compared to noise-exposed, saline-treated animals. Continuous noise was an octave band noise centered at 4 kHz, delivered at 105 dB SPL for 6 hrs. Impulse noise was composed of 75 pairs of impulses at 150 dB SPL given at a rate of two per second.

While engineering and personal hearing protection devices have been, and will continue to be mainstays of noise-induced hearing loss prevention, there is much anticipation that antioxidant molecules may play an important adjunctive role in hearing conservation practices in the future. To keep your hearing conservation training up to date, continue looking for more information about pharmacological noise research in this publication and in the scientific literature.

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COL Richard Kopke, MC, US Army, is the Co-Director of the Department of Defense Spatial Orientation Center, where he leads a team committed to inner ear hearing and balance research. He was recently awarded the Edmund Prince Fowler Award by the Triological Society on research involving the mitigation of acoustic trauma with antioxidants.

Dr. Richard Danielson is an Associate Professor of Audiology at Baylor College of Medicine, with assignment to Johnson Space Center-NASA as its Hearing Conservation Program Manager. He recently retired from active duty as an Army audiologist after 28 years of military service.

UPCOMING OHC CERTIFICATION AND RECERTIFICATION COURSES* 2003

*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 January 31, 2003 (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.

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3/5/2003	OH	Cincinnati	Timothy A. Swisher	412/367-8690	4/9/2003	OH	Worthington	Timothy L. Rink	614/885-2997
3/5/2003	TX	Fort Hood	Vickie L. Tuten	Army	4/11/2003	MA	Brighton	Nancy E. Peterson	617/254-7300
3/5/2003	KY	Ft. Campbell	Kristen L. Casto	270/956-0305	4/11/2003	FL	Miami-Ft. Lauderdale	John H. Elmore	800/357-5759
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New CAOHC Council Members Are Welcomed

Mary McDaniel, MS CCC-A replaces Myrna Stephens as one of two ASHA representatives on the Council. McDaniel has worked exclusively in occupational audiology and hearing conservation in the Pacific Northwest since 1984. She also serves as an adjunct audiologist to the Center for Hearing Health in San Ramon, California. In June of 1995 she formed her own consulting firm, Pacific Hearing Conservation, Inc. in Seattle, WA. McDaniel received a BS in Speech Pathology & Audiology from North Dakota State University and an MS in Audiology from Minot State University. In addition, she has been a certified CAOHC Course Director since 1992 and is a Past President of the National Hearing Conservation Association.



Peter Rabinowitz, MD MPH will represent the American College of Occupational & Environmental Medicine (ACOEM) replacing Dr. Holthouser. Dr. Rabinowitz is Assistant Professor of Medicine at the Yale University School of Medicine in New Haven, CT, and is also Director of Clinical Services for the Yale Occupational and Environmental Medicine



Program. He is board certified in Occupational and Environmental Medicine, General Preventive Medicine, and Family Medicine. He is currently vice chair of the Noise and Hearing Committee of the American College of Occupational and Environmental Medicine (ACOEM). He also serves as an occupational medicine consultant to Alcoa, Inc.

John Elmore, MA MBA will join the CAOHC Council at their spring 2003 meeting in Atlanta, Georgia as a representative for the American Society of Safety Engineers (ASSE). Elmore has been a CAOHC Course Director since 1981 and is an audiologist and owner of Precision Hearing Conservation in Texas. He is a retired Lt. Col. for the US Air Force and has over 32 years experience in hearing conservation.

As a military audiologist, Elmore established the first, base-wide Army and Air Force Hearing Conservation Programs. He has represented the United States as a member of the NATO committee on health effects from low altitude aircraft noise and has served on the Executive Boards of several national professional organizations.





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