Winter/Spring 2004

UPDATE

VOLUME 16 • ISSUE 1

The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

How Did My Tinnitus Become So Annoying?

By Craig Newman, PhD

Editor's Note: Tinnitus, noises in our ears in the absence of real sounds, plagues all too many of us. A common cause of tinnitus is exposure to high-level noise and the noise-induced hearing loss that follows. As OHCs you work with employees all the time who need to learn hearing-healthy skills such as proper use of hearing protection and avoidance of dangerous sounds. However, for many of them tinnitus may already be a fact of life. The following article, reprinted from 'Tinnitus Today' provides a valuable perspective on this malady and actions that may help to mitigate its effects.

Patients often ask me, "Can you cure my tinnitus?" My answer back is, "I can't cure the tinnitus or make it go away. But what we can do together is get the tinnitus to a point where it becomes neutral or is no longer bothersome. And that way, you can get some relief."

I'd like to give you a little introduction about why people feel that their tinnitus has gotten so annoying. First, there are about 50 million people in the United States who have tinnitus. Out of those, there are about 12 million people who have tinnitus to a degree where they seek professional help, usually from a physician or an audiologist. And out of those people, two to four million people are truly handicapped by their tinnitus, in that they have sleep difficulty and a number of other problems.

Interestingly, in our audiology clinic, which is a hearing clinic, about three-quarters of the patients we see have problems with their tinnitus. This suggests to us that our patients who have some degree of bothersome hearing loss also have some degree of tinnitus. Often the persistence of the tinnitus is the problem, and by persistent tinnitus I mean the "Boy-I-wish-I-could-just-kind-of-take-my-head-off-and-put-it-over-there" kind of tinnitus. For some people the problem is in understanding speech, although it is difficult to know if that is caused by the tinnitus, the hearing loss, or both.

Other tinnitus-caused problems include the inability to relax (where the patient says, "The tinnitus really stresses me out"), difficulty concentrating and reading, interference with social life, and interference with family life. They feel frustrated, upset, and irritable. It's their emotional reaction to everyday problems that is itself a big problem.

Let me explain how tinnitus is generated. Initially there is probably some type of insult to the hair cells in the inner ear, maybe by noise exposure, maybe by medication, maybe by some other type of disease process. When that happens, the electrical responses from the injured parts of the inner ear actually increase and send an excess of electrical response to the brain. The hissing sounds, ringing sounds, and cricket types of sounds are probably just the way our brains perceive those excess electrical signals.

So how does tinnitus become so annoying? How does a person get to the point where he or she feels that the tinnitus has taken over? The people who ask me those questions also often say to me, "My tinnitus really bothers me at night or when I'm in a quiet place." There's a fairly simple explanation for that, and I'll explain it with a story. If you had a birthday party and put birthday candles on a cake and carried the cake from your kitchen to your dining room table to sing "Happy Birthday," what do you do? You turn off the lights to make the candles seem brighter. If you left the lights on, the candles wouldn't have such a dramatic effect. The same thing happens with our ears. When there is quiet in the background, the tinnitus seems louder because the contrast between the quiet and the tinnitus is so great. When there is some type of sound enrichment in the background, whether it's a sound generator, a special CD, the TV or radio, there is less contrast, and the tinnitus doesn't seem as loud. That's why at nighttime, when you go to bed and turn off the lights and all outside sounds, the tinnitus seems louder.

After a person becomes aware of the tinnitus signal and has identified it as being somewhere in the head or ears, the individual can self-measure the loudness of it by using a scale that was put together in 1993 by a researcher named Richard Hallam. Very often when audiologists do the physical measurement of the tinnitus loudness, they find that the matching sound isn't very loud – even though the patient perceives it as very loud.

You can try this self-measuring test. Write down the number that matches your tinnitus loudness level, where

continued on page 6

Content

UPDATE

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:*

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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

By Beth A. Cooper, PE INCE Bd. Cert.
Representative of the Institute of Noise Control Engineering

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. Perhaps you work closely with the other members of the team. If so, you are probably well aware of the interrelationship of the various program elements and how closely the success of the entire program depends on the coordination and communication between the members of the hearing conservation team. If your role is limited to audiometric testing, you may not have much interaction with team members who represent the industrial hygiene, safety, engineering, and program management elements of the program. Although your job *function* may not demand that interaction, your appreciation for your own role in the program and your satisfaction as an OHC will be enhanced if you are able to increase your involvement in other aspects of the program. Did I just say that asking for more work will help you appreciate and enjoy the work you already have? Well, it's true!

I can't think of a more vivid example of an interdisciplinary science than the field of hearing conservation. By definition, and even by law, it is almost impossible for one person to accomplish all of the technical and regulatory requirements, let alone implement an effective "best practices" program (unless you are qualified as an audiologist or physician AND as a noise control engineer – and I know only one person who can claim this distinction). Furthermore, the elements of a hearing conservation program are sometimes at odds with one another and often seem to be competing with business goals. Frankly, there is just far too much work that needs to be done, from audiometric testing to noise surveys, to employee training and all of the recordkeeping that goes along with it. We all need one another's contributions, insights, understanding, *and* encouragement. The more we understand about how our own role relates to the "other" elements of the program, the more productive we can be individually and collectively.

As a noise control engineer, I often find myself on the periphery of the hearing conservation programs I support, sometimes feeling like I'm not really involved in the day-to-day substance of the program – not at the "front lines" or "in the trenches" like my colleagues who work directly with noise exposed employees or who spend more time in the field. Maintaining connections with those team members (whose jobs are equally distinct and who probably sometimes feel isolated themselves) is energizing for all of us and is essential for the overall program to function optimally. There is no "main" or "most important" element of a hearing conservation program. The complexity and comprehensiveness that demands our interdependence and increases our appreciation for what others bring to the team is what makes hearing conservation so unique and so fascinating. I wouldn't have it any other way!

Thompson Joins Council as AAOHN Representative

Maureen Ann Thompson, RN COHN-S/CM joins the CAOHC Council as a second representative for the American Association of Occupational Health Nurses (AAOHN). Thompson has over twenty-five years of experience in the occupational health arena. She holds certifications by the American Board of Occupational Health Nurses as an Occupational Health Nurse Specialist/Case Manager, among others, and is a CAOHC-certified Occupational Hearing Conservationist.

Her current responsibilities include managing an employee health unit — supporting a 3200-person healthcare workforce. Thompson's teaching experience includes: adjunct faculty member at Johns Hopkins University, School of Public Health and Hygiene Summer Institute programs; guest lecturer at the University of Maryland, School of Nursing; and the U.S. Postal Service in Baltimore.

She is an active member of the American Association of Occupational Health Nurses, Inc and currently President of the local Maryland chapter.

Occupational Hearing Conservationists (OHCs) Mandatory Certification/ Recertification

Effective July 1, 2004

Beginning July 1, 2004, the CAOHC Council will require that all Course Directors (CDs) collect applications and fees for students who successfully complete the CAOHC requirements in an OHC course. This process has come to be known as "bundling."

The decision to require bundling will promote uniform certification requirements for all OHCs and is in keeping with the current practices of approximately 80% of the current CDs. The decision was reached with input from Course Director (CD) surveys and supports our intention to align OHC certification requirements with those of other similar medical professionals.

We believe that mandatory certification of OHCs…

- Better defines the criteria for professional recognition.
- Identifies the body of knowledge and the work experience needed to qualify as a certified occupational hearing conservationist for industry and mining.
- Stimulates and encourages the professional development of all individuals in the field.
- Measures the candidate's knowledge and ability with respect to the current state of the art.
- Provides personal satisfaction with recognition of competency among a professional group.
- Benefits the hearing health of occupationally noise-exposed workers.

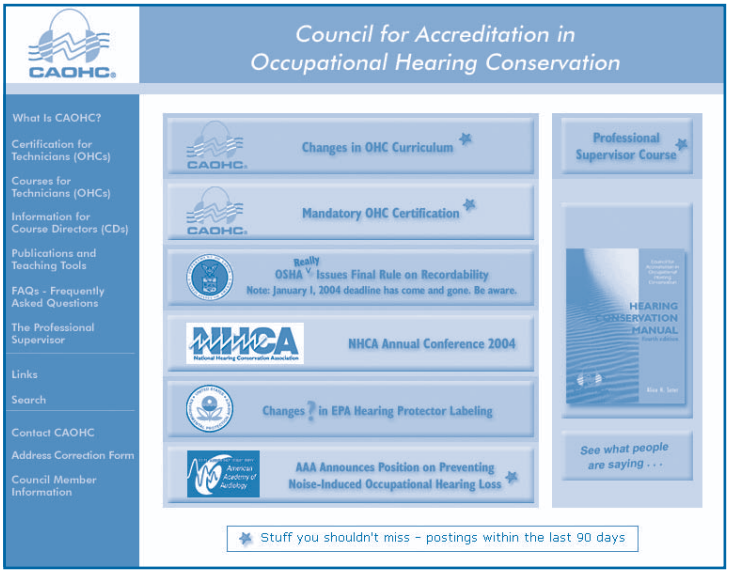
Once you successfully complete a certification or recertification course, your application and fee will be forwarded for processing to the CAOHC office by the Course Director who taught the course. You will receive a letter of congratulation, a certificate with a personal certification number, and an ID wallet card from the CAOHC office within approximately 60 days of the course. For further details or questions, contact your Course Director or the CAOHC office at 414/276-5338 or e-mail: info@caohc.org

CAOHC Website Upgrade

We invite you to visit our recently revised website at www.caohc.org. We've added "stars" on important information you won't want to miss. As a reminder, the sites of specific interest to Occupational Hearing Conservationists are headlined as "Certification for Technicians (OHCs)." Don't forget to use the "Market Yourself" selection – it's a sample to help you let your community know about your CAOHC certification!

You'll find OHC courses are easier to locate by filling in the city, state, or date you need, or by entering your Course Director's last name. We have added a "feedback" link at the "Contact CAOHC" menu choice that enables you to express your comments about the CAOHC course you completed. 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



Hear for the Future– Communities Urged to "Protect Their Hearing, Protect Their Health" on

International Noise Awareness Day, Wednesday, April 28, 2004

"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.

Among the many activities planned during **International Noise Awareness Day**, **Wednesday, April 28th**, 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.

For a complete listing of all activities go to: The Noise Center website at www.lhh.org/noise or by contacting Amy Boyle via email at aboyle@lhh.org. LEAGUE FOR THE HARD OF HEARING, 50 Broadway, 6th Floor, New York, NY 10004

OHC Corner

When The OHC Goes Home . . . What Next? The OHC'S Guide To Establishing an Effective Hearing Conservation Program

By Beth A. Cooper, PE INCE Bd.Cert.
Representative for the Institute of Noise Control Engineering

Part 2 in a series of 2:
Expanding the OHC's role in the hearing conservation program

Editorial Note: This article was planned for presentation in 3-parts [see reference next page]. The content has been edited to two parts.

This is the second installment in a two-part series of articles about the CAOHC-trained OHC's role in a comprehensive hearing conservation program (HCP). For most OHCs, activities related to audiometric testing occupy the bulk of their day-to-day duties. However, there are many roles beyond audiometry that may be effectively assumed by a CAOHC-trained OHC. This installment will discuss several functions that may be performed by CAOHC-trained OHCs in the context of an occupational hearing conservation program.

The OHC works with the Professional Supervisor and other professionals

In the first installment in this series (Cooper, 2003), we reviewed the elements of a hearing conservation program and discussed the need for at least two (and probably three) members on the hearing conservation team. By law, an audiologist or physician must serve as Professional Supervisor (PS) of the audiometric monitoring component of the hearing conservation program. Often, there is also an additional audiologist and/or otolaryngologist who provides follow-up consultation for those cases referred by the Professional Supervisor. The third essential member of even the most skeletal hearing conservation team is a qualified noise control professional, who could develop engineered solutions to noise exposure problems (and who may also handle noise exposure assessments as well). With those exceptions, a CAOHC-trained OHC can pick and choose liberally from among the vast collection of duties and responsibilities that comprise a comprehensive hearing conservation program, combining them into a visible and satisfying position as the focal point of the program.

The OHC's primary role is in the clinic

The fundamental aspects of the OHC's role consist of duties associated with conducting air-conduction audiometry, including baseline, annual, and retest exams. These exams should include a visual and otoscopic inspection of the ear (prior to audiometry) as well as taking an otological history, all of which are often performed by the OHC. The OHC may screen audiograms for review by the Professional Supervisor, based on guidelines provided by the PS.

Daily care and calibration of audiometric equipment is also typically the responsibility of the OHC, as should be the maintenance of equipment calibration records and the scheduling and documentation of other periodic equipment calibrations, per regulatory requirements. Finally, the OHC can schedule and document the annual assessment of ambient noise levels in the testing environment, although the assessment will most likely be made by an industrial hygienist or other qualified team member.

Reasonable limitations on the OHC's role protect both the OHC and the employer

Unless the OHC has other specific training in audiology, the OHC's involvement in hearing testing is limited to pure-tone air conduction testing. Furthermore, CAOHC training does not prepare or qualify the OHC to interpret audiograms, to determine work-relatedness, or to diagnose hearing problems or medical conditions. OHCs who work closely with their audiometric monitoring program's Professional Supervisor will find that there is a natural division in responsibilities that accommodates both the limitations on the OHC and the specific responsibilities of the Professional Supervisor as defined by the Professional Supervisor's Scope of Practice (see CAOHC website for OHC Scope of Practice at http://www.caohc.org/scopeofpractice.html and the Professional Supervisor Scope of Practice at: http://www.caohc.org/professionalsupervisor.html). Whether the PS and OHC work together in the same physical location or are separated geographically, the OHC *must* act with the direction and support of the Professional Supervisor, despite organizational and geographic challenges that may complicate the working relationship.

CAOHC-trained OHCs who take their responsibilities seriously will understand the importance of the training they've completed and will not attempt to "train" other OHCs in lieu of their attending a CAOHC-approved training course. Additionally, OHCs will not allow the unauthorized use of their personal CAOHC certification number.

OHCs may expand their clinic role into program management

Despite the limitations on the OHC's role and the requirement for a qualified Professional Supervisor, there are ample opportunities for OHCs to become more involved in the management of the hearing conservation program and to contribute in a quantifiable way to the success and regulatory compliance of the audiometric monitoring element of the program. In particular, management of an audiometric database is an important responsibility that dovetails well with the OHC's other job functions and is one that has a direct impact on the success and regulatory compliance of the overall program. Tracking exam dates, scheduling annual audiometric exams and retests, and notifying employees regarding the results of audiometric exams can present a rigorous challenge, particularly in larger programs. Whether or not the goals are acknowledged and vigorously embraced

continued on page 5

When The OHC Goes Home . . . What Next?

continued from page 4

by the employer, they can be daunting for any OHC: attaining 100% participation in annual testing and achieving complete follow-through on employees who have demonstrated an STS. In addition to scheduling and conducting the audiometric exams, the OHC's role can include preparing associated documentation and satisfying regulatory record-keeping requirements, as well as developing and reporting performance and regulatory compliance metrics for the audiometric monitoring program.

The OHC can become the recognized "face" of the Hearing Conservation Program

Although the Professional Supervisor of the audiometric monitoring component of the program must be an audiologist or physician, that person need only be involved in the clinical aspects of the hearing conservation program. The CAOHC-trained OHC is appropriately qualified and often well-positioned to function as the focal point for the management of the overall hearing conservation program. An OHC who is excited about hearing conservation will likely want to consider an expanded role that provides opportunities to work with the other members of the hearing conservation program team. For instance, the OHC can be responsible for notifying industrial hygiene and/or safety personnel when an STS has been demonstrated by an employee assigned to a particular work area. More importantly, the OHC can then coordinate the successful implementation of whatever follow-up actions are appropriate, including investigative noise exposure assessments and any resulting noise control engineering interventions. The importance of a central focal point cannot be underestimated, since the interdependence of employee audiometric test results and noise exposures can be positively affected only if it is understood and acknowledged by all program stakeholders.

The OHC's role as the "face" of the hearing conservation program is most important when interacting with the program's constituency (the noise-exposed employees). Although much of the follow-up activity will take place between the employee and an audiologist or physician when an STS has been identified, OHCs who desire more direct contact with their constituents will seek to further expand their responsibilities to include providing the counseling that is required by law for employees who have demonstrated an STS. This conversation affords a critical opportunity for the OHC to affirm the credibility of the hearing conservation program and to positively affect the life of an employee; the credibility and care with which this counseling should be offered cannot be overstated.

CAOHC training prepares OHCs to assume significant and visible responsibilities outside of the clinic

By virtue of their CAOHC training, OHCs are uniquely qualified on the hearing conservation team to assume responsibility for selecting, fitting, dispensing, and monitoring the use of personal hearing protectors in the workplace. In addition, the employee counseling that follows the identification of an STS includes providing and/or refitting personal hearing protection.

Undoubtedly, the most exciting opportunities for the OHC to influence the success of the hearing conservation program involve developing and conducting annual hearing conservation training for noise-exposed employees and their management. The OHC's position as the focal point of the program provides both the authority from which to speak and a vantage point from which to compile a comprehensive training session that speaks to all of the elements of the hearing conservation program in a way that motivates and educates both employees and management.

As with the audiometric monitoring element of the program, there is the need for disciplined and capable scheduling and tracking of hearing conservation training so that all exposed employees receive annual training that meets regulatory requirements. Likewise, the need exists for developing and reporting metrics that quantify regulatory compliance with hearing-conservation-training attendance requirements. There is some economy of scale associated with combining the two databases so that training and audiometric monitoring compliance are managed by the same person.

The exact composition of a particular OHC's job will depend on the organization of the hearing conservation program, the composition of the hearing conservation team, and the particular interests of the OHC. CAOHC training provides ample options and flexibility for OHCs to fully participate in and, often, to manage the hearing conservation program. An OHC who seeks personal challenge and increased job satisfaction may want to consider a more comprehensive role in the implementation and management of the hearing conservation program. Whatever the roles offered to the OHC by their supervisors, and whatever increased roles are sought by the OHC, CAOHC encourages the highest level of professionalism possible in hearing conservation efforts. Everyone's roles are vital!

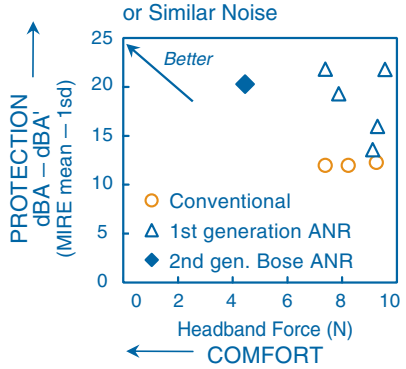
References:

Cooper, BA (2003). "When the OHC Goes Home…What Next: The OHC's Guide to Establishing an Effective Hearing Conservation Program" Part 1, UPDATE, 15(1), p. 4 and 6.

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.

ERRATA The following is a corrected graph relating to our previous issue's "Should You Consider ANR for Hearing Protection?" (Vol. 15, Issue 3, Fall 2003, P. 9).

Figure 2: Noise Reduction versus Comfort in General Aviation or Similar Noise



How Did My Tinnitus Become So Annoying?

continued from page 1

the sound described is the same loudness or just louder than your tinnitus.

1 – The sound of your own breathing
2 – A quiet watch near your ear
3 – The refrigerator motor
4 – A normal conversation
5 – Hail stones on a window that you are sitting beside
6 – A vacuum cleaner that you are using

In comparison to a very large population of people with tinnitus, how much louder or quieter is your tinnitus? If you scored a "1" – the sound of your own breathing – your tinnitus is louder than that of about 86% of the patients studied, and quieter than about 14%.

Tinnitus gets annoying as we began to listen to it, and it gets louder and louder as we focus our attention on it. And as it becomes louder, it becomes more annoying. As the annoyance grows, we become fearful that it will continue to increase in loudness and maybe even get a little out of control.

We now know that there are actually parts in the brain that detect or that become active when the tinnitus is active. So, even while there is a problem with the hair cells in the inner ear, it's the feeling of stress that is decreasing a person's ability to cope with the tinnitus. If tinnitus becomes the only thing you listen to and really focus on, I call that the "All-Tinnitus Network" – the only station you're watching. It may become impossible to ignore it. If I say to you, "Stop thinking about pink elephants," well, what are you thinking about? You're thinking about pink elephants! It's not possible to just stop thinking about tinnitus, but there are strategies to help you get to that point where the tinnitus is not the only thing you are thinking about.

It's also interesting that we have emotional reactions to sound. For example, imagine the sound of footsteps – clap, clap, clap – down the street. You would have a very neutral response to the sound if someone were jogging along with you. On the other hand, if your grandchildren were running to you and you heard those footsteps, a completely different emotional reaction to the sound would occur, probably one of happiness. On yet another hand, the sound of footsteps at night as you're getting into your car could make your heart race a little and might generate a sense of fear. The point is that a single sound can create several different emotional reactions in us. Tinnitus is a sound that can cause different types of emotional reactions.

So what controls our emotional reactions to sound? There is a part in our brain, called the limbic system, that controls our emotional reactions to events in our lives. When we feel threatened, the limbic system goes on high alert so we can pay more attention to whatever it is that is threatening us. When we hear a threatening sound, the limbic system goes on high alert so we can focus more on the sound. If we think of our tinnitus as threatening, then the limbic system goes on high alert to make us even more aware of the sound.

The goal of a tinnitus treatment strategy should be to make the tinnitus sound neutral so it doesn't make that part of the brain light up and give us that response to the tinnitus that we don't like. A tinnitus treatment strategy should break the vicious tinnitus cycle: detecting the tinnitus, associating it with a threat, being bothered and stressed by it, and sensing danger, which causes us to detect it again. We can stop the cycle through a variety of management strategies. This is truly the point: There is help.

The help that's available can get people through the different stages of tinnitus. In *stage one*, the tinnitus is persistent. The stage-one person says, "I always know it's there, it bothers me, and I worry about it." The goal of any tinnitus management strategy should be to get the patient to *stage four* where attention is rarely given to it, where the importance of it has been taken away, and where the sound has become neutral.

There are a variety of management strategies that can get people to that tinnitus relief. The first is counseling. To me, knowledge is power. And the more you understand tinnitus, and why people have it and react to it, the easier it is to deal with. In my opinion, it is possible to move from what we call the *intolerance of the tinnitus* to a state of *tolerance of the tinnitus*. I hope that when you go through any treatment plan with an audiologist or other healthcare provider that you get to the tolerance of tinnitus level – that it becomes as neutral as a walk along the beach, and that you know it will not bother you again.

Dr. Newman is Section Head of Audiology and Co-Director of the Tinnitus Management Clinic at The Cleveland Clinic Foundation. He can be contacted at 216/445-8520.

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CAOHC EXHIBITING AT AOHC

The annual American Occupational Health Conference (AOHC) will be held in Kansas City, Missouri on April 30-May 7 2004 at the H.Roe Bartle Hall. This joint meeting of the American Association of Occupational Health Nurses (AAOHN) and the American College of Occupational & Environmental Medicine (ACOEM) is the premier 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 Barbara Lechner, CAOHC Executive Director, (pictured here) will be there during the exhibit dates of May 4-6, 2004 at **Booth #822**. Stop by and introduce yourself! See p.11 for information on the Professional Supervisor course at AOHC.

A Common Misunderstanding About Noise Exposure Assessment and the Regulations

By Dennis P. Driscoll, PE
Associates in Acoustics, Inc.

Knock, knock. Who's there? OSHA. OSHhhhhhh! Ever experience that sinking feeling in the pit of your stomach when you set out to conduct your plant's noise exposure survey, or are asked by management to describe where the company stands relative to compliance with the applicable noise regulation? If you conduct noise surveys on a regular basis, then you are probably quite comfortable and never feel stressed out. However, if you are like most Occupational Hearing Conservationists (OHCs), who may only conduct a survey once every year or two, then you can probably relate to that anxious sensation you feel as you think to yourself: "I know I took the seminar, and have been designated the plant's "expert," but I am not totally confident I am doing everything right." To help clear up a common misunderstanding about the noise exposure requirements and build upon, or reinforce, your current knowledge base for regulatory compliance, test yourself with the following question:

Question: When monitoring to determine actual or representative employee noise exposures under the Federal Occupational Safety and Health Administration (OSHA) Occupation Noise Exposure Regulation, 29 Code of Federal Regulations (CFR) 1910.95, or the Mine Safety and Health Administration (MSHA) noise exposure regulation, 30 CFR Part 62, how many time-weighted averages (TWAs) do the regulations indicate you should determine per employee for compliance purposes?

Answer (choose one of the following):
A. 1 TWA
B. 2 TWAs
C. 5 TWAs
D. Not required to determine a TWA

If you answered one TWA, then you are wrong; however, rest assured you are probably in the majority of respondents. A few plausible reasons most OHCs think only one TWA is required for compliance will be discussed later in this article. The question above is really straightforward, and the answer is two TWAs. One TWA is assessed with a high threshold level and the second TWA with a low threshold level[1].Recall from the relevant OSHA and MSHA regulations you must determine compliance with both the Permissible Exposure Limit (PEL) and the Action Level (AL) for each employee. The PEL is equivalent to a TWA of 90 dBA, and the AL is equal to a TWA of 85 dBA. The PEL uses a high threshold level of 90 dBA, and the AL employs a low threshold level of 80 dBA. In other words, for compliance with the PEL all sound levels below 90 dBA are ignored in the exposure calculation. However, all sound levels below 80 dBA are disregarded for compliance determination with the AL. For example, the following table exhibits a noise exposure scenario for a wood worker in the Fabrication and Assembly

[1] Some State OSHA occupational noise exposure regulations only use a low threshold level (i.e., the State of Washington), superceding the Federal regulation that requires two separate thresholds.

continued on page 8

JOB TITLE: Wood Worker
DEPARTMENT: Fabrication and Assembly
SHIFT LENGTH: 8 hours

Calculations are based on guidelines established by the Mine Safety and Health Administraion (MSHA) and Occupational Safety & Health Administration (OSHA) Occupational Noise Exposure Standards 30 CFR Part 62 and 29 CFR 1910.95.
(5-dBA EXCHANGE RATE)

ACTIVITY OR SOURCE NUMBER	JOB ACTIVITY	SOUND LEVEL, dBA	REFERENCE DURATION, MINUTES (FROM REG.)	EXPOSURE TIME, MINUTES	ACTION LEVEL % DOSE PER SOURCE (80-dBA Thres.)	PEL % DOSE PER SOURCE (90-dBA Thres.)
1	Hammering	89	551	30	5.4	0.0
2	Band Saw	95	240	30	12.5	12.5
3	Planer	88	633	60	9.5	0.0
4	Jointer	93	317	60	18.9	18.9
5	Router	96	209	120	57.4	57.4
6	Lathe	89	551	90	16.3	0.0
7	Clean-up	82	1455	30	2.1	0.0
8	Lunch/Breaks	65	NA	60	0.0	0.0

USING ACTION LEVEL CRITERIA FOR INCLUSION IN A HEARING CONSERVATION PROGRAM:

(Under MSHA use 30 CFR Part 62, Table 62-1)
(Under OSHA use 29 CFR 1910.95, Table G-16a)

TOTAL ACCUMULATED DOSE: 122.2 %

CALCULATED TWA: 91.4 dBA

USING PEL CRITERIA FOR ENGINEERING NOISE CONTROLS AND MANDATORY HEARING PROTECTION:

(Under MSHA use 30 CFR Part 62, Table 62-1)
(Under OSHA use 29 CFR 1910.95, Table G-16)

TOTAL ACCUMULATED DOSE: 88.9 %

CALCULATED TWA: 89.1 dBA

A Common Misunderstanding About Noise . . .

continued from page 9

Department, as determined during an 8-hour work shift: The job activity presented in the table indicates the wood worker is exposed to 89 dBA for 30 minutes while hammering, various other levels and exposure durations throughout the shift, and 60 minutes for breaks and lunch at an average sound level of 65 dBA. The total duration of all job activities is 480 minutes, or 8 hours. As reported toward the bottom of the table, the first TWA with the low threshold (80 dBA) calculates to approximately 91 dBA, which means this worker or job activity is exposed to noise above the AL. The second TWA with the high threshold level (90 dBA) is roughly 89 dBA, which is below the PEL. Based on these results, the wood worker must be included in a hearing conservation program, but implementation of feasible administrative or engineering noise controls are not required. Hearing protection must be available and is recommended for use, unless the worker has a standard threshold shift in his or her hearing (as defined by the appropriate regulation), at which point hearing protection is then required for the affected worker. (See applicable regulation for specific program requirements, and/or see pp. 40-42 of the *Hearing Conservation Manual, 4th Edition*, authored by A.H. Suter, edited by E.H. Berger, for a list of program requirements.)

As described previously, two separate TWAs are specified for compliance purposes. Certainly, from a "best practice" standpoint it is likely most hearing conservation professionals recommend using only the TWA measured with the low threshold as the basis for all program decisions, such as mandatory hearing protection usage, noise controls, and tracking noise exposure with each worker's audiometric test records. Hence, this may explain why a likely majority of OHCs answered one TWA to the question above.

For OHCs working with facilities under OSHA jurisdiction, another plausible reason for responding that one TWA is required can be traced to the fact the Hearing Conservation Amendment (29 CFR 1910.95 (c) - Hearing conservation program) went into effect in 1983, which was 12 years after the initial Occupational Noise Exposure regulation. Keep in mind the original 1971 Standard mandated three requirements upon employers whenever worker TWAs exceeded the PEL. The requirements were designed to protect workers against the effects of high noise exposure through: (1) feasible administrative or engineering controls, (2) mandatory usage of hearing protection, and (3) implementation of a continuing, effective hearing conservation program.

To this day under the OSHA regulation, the need for feasible administrative or engineering controls *and* the mandatory use of hearing protection is determined for compliance purposes using the TWA measured with the high threshold level. However, because of the ambiguity in the 1971 Standard as to what constituted "an effective hearing conservation program," the 1983 Hearing Conservation Amendment became necessary to definitively spell out the requisite components of an effective program. It was with promulgation of the 1983 Amendment where establishment of the AL (85 dBA) and use of the low threshold level were introduced. Since OHCs and other health and safety professionals are trained to use the TWA measured using an 80-dBA threshold level for determining who must be included in a hearing conservation program, this TWA metric is most familiar to them. In addition, OHCs rarely get involved with the administrative or engineering noise control aspects of the regulation, nor compliance with the PEL. In fact, as strange as this may sound, the OSHA Occupational Noise Exposure regulation never even uses nor defines the term PEL. So it is reasonable to conclude OHCs operate under the assumption only one TWA is required.

This is not necessarily the case for OHCs dealing with facilities under MSHA jurisdiction, as the current Occupational Noise Exposure regulation went into effect in September 2000. Since the MSHA rule is fairly recent, and discusses measurement of TWAs for comparison to both the PEL and hearing conservation AL, it is reasonable to expect that OHCs complying with the MSHA rule are most likely to answer two TWAs to the question above.

So what is the ramification if you had a misunderstanding about the requirement for two TWAs? In practice, very little, unless the management at your plant is rigorously trying to control short-term costs by limiting as much as possible the implementation of feasible engineering noise controls. In that case, it is certainly possible to reduce the number of areas in which noise controls may be required by lowering the measured TWAs using the higher threshold. However, if your plant's or company's hearing conservation efforts are managed solely using the low threshold level TWA, then the bottom line is the program follows the "best practice" approach advocated by many professionals. Consequently, an added level of protection above the regulatory requirements is being provided to the workers. From the author's experience, many companies, both large and small, use only the low threshold level TWA to direct all hearing conservation efforts. So whether it is intentional or unintentional, managing a hearing conservation program with only the low threshold TWA is totally acceptable and advisable, and will certainly meet all regulatory requirements.

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COUNCIL REVISES EXPIRATION LIMIT FOR OHCs

Effective July 1, 2004 certification extensions for OHCs will be limited to 60 days beyond their current expiration date. All requests must be received at the CAOHC office 30 days prior to the expiration and are subject to the approval of the CAOHC Council. This is intended for OHCs having difficulty locating a course in a specific geographic area, for serious illness, or for a death or serious illness in the family (example: an OHC due for renewal July 1, 2004 would have until August 29, 2004 to take an 8-hour refresher course).

When submitting a request for extension: 1) mail, fax, or E-mail CAOHC indicating the circumstance a minimum 30 days prior to your expiration date. (*CAOHC address, fax and e-mail can be found on the inside front page of this newsletter.)* We will provide you with a written response from the Council indicating whether your extension has been allowed. If you are granted an extension, please present that to your CAOHC Course Director at the time of your recertification course. Your new certification expiration date will be five years forward of that course date.

If your recertification date expires, without approval for extension, you are required to take the 20-hour course.

Music-Related Hearing Loss and Its Prevention- Humming, Earplugs, and Moderation

By Marshall Chasin, AuD, M.Sc., Reg. CASLPO, Aud(C), Audiologist

Introduction

Hearing loss is a gradual process that may not be noticed for years. When it does happen, people generally remark that speech appears mumbled and unclear. They may also report a ringing (or tinnitus) in their ears or head. By that time, the only thing that may help is a hearing aid. While hearing aids have improved dramatically, they are not perfect and hence cannot restore normal hearing.

Once you leave work, there are many sources of noise in everyday life: traffic, loud music, personal CD players, lawn mowers, snowmobiles, and motor boats, to name a few. Even a noisy hockey arena can be damaging! Depending upon how long you are exposed, noises that do not seem terribly loud can also damage your hearing. It is quite surprising how quiet an 85-dBA noise sounds to many people.

A permanent hearing loss can be the result of a single loud blast (acoustic trauma), but more often it is the result of years of exposure to sounds that one may not normally think of as damaging. Just as in the industrial realm, there are potential sources of acoustic trauma in the musical venue too. These may include feedback squeals during sound checks, inappropriately set limiters, percussive blasts from cannons and blocks of wood being smashed together, and being stuck in front of a large stack of speakers for an extended performance. While there is scant research in the literature on this subject area, clinically hearing losses have been reported (and confirmed) where the source was a single or relatively short duration blast. Industrial environments are in this sense, sometimes more controlled than musical venues.

Acoustic trauma and the musician

Most of the models of noise-induced hearing loss are adequate for levels up to 115 dBA; however, they tend to break down for more intense impulse stimuli. Price & Kalb (1991), and Price (1994) investigated the effects of intense impulse sounds and found that the motion of the basilar membrane during the impulse sound was also important for the prediction of hearing loss (other than intensity and duration). Price (1994) notes that "at lower SPLs losses are in all likelihood largely a function of the metabolic demand on the inner ear (it gets 'tired out') and that above some spectrally dependent critical level, the loss mechanism changes to one of mechanical disruption . . . (the ear gets 'torn up')."

A few words about audiometry

Acoustic trauma typically shows up at, or near, the spectral peak frequency of the offending stimulus. For example, a feedback squeal at 2000 Hz will generate a sensorineural hearing loss at about 2000 Hz. In contrast to acoustic trauma, hearing loss from long term noise or music exposure is typically in the 3000-6000 Hz region, and although there is a small dependence on spectral shape, this notched loss tends to be a hallmark of noise or music exposure. What are the causes of the non-monotonic nature of noise-induced hearing loss that creates an audiometric notch? Several explanations have been proposed for this notch. These include (a) a poor blood supply to the part of the cochlea that corresponds to the 3000 to 6000 Hz region (Crow, Guild, & Polvogot, 1934); (b) a greater susceptibility for damage of the supporting structures of the hair cells in this region (Bohne, 1976); (c) the orientation of the stapes footplate into the inner ear is such that its primary force vector aims toward those hair cells in this region, with the effect of eventual failure because of the constant hydromechanical action (Hilding, 1953; Schuknecht & Tonndorf, 1960); and (d) since all spectra are enhanced at 3000 Hz by the earcanal resonance, the greatest loss will be in the 4000 to 6000 Hz region (Tonndorf, 1976). Because of these phenomena, hearing losses due to noise (including music) tend to have an audiometric pattern that is suggestive of their cause and assists in their diagnosis.

However, many clinical cases of music or noise exposure do not possess an audiometric notch. Indeed, Barrs, Althoff, Krueger, & Olsson (1994) found that only 37% of workers suffering from noise exposure possessed an audiometric notch. It is quite possible that in advanced cases of exposure or advanced age where there is a significant age-related hearing loss (presbycusis), the hearing sensitivity at 8000 Hz may have also deteriorated, leaving a flat audiometric configuration. In addition, depending on the noise spectrum, the frequency region of greatest damage may be above the audiometric test frequencies. For example, using data derived from violin players, the frequency of greatest damage can be at 8000 Hz, and unless a higher frequency pure tone were to be assessed (e.g. 10,000 Hz), a notch would not be apparent.

Alberti (1982) argued that noise induced hearing loss should be symmetrical- roughly equal hearing loss in both ears. This may be true in the industrial environment, however, asymmetrical hearing losses are commonly found among those in the performing arts. These musicians work in relatively non-reverberant conditions where asymmetrical noise/music sources (e.g. drummer near the right ear) may result in substantially higher noise exposures to one ear than the other. Because of the significant mid- and high-frequency sound pressures (i.e., short wavelengths), the head acts to further attenuate the off-side music exposure such that the other ear is in an acoustic shadow and is subsequently more protected. Having said this, audiometric asymmetries can be signs of serious potentially treatable medical problems and should be referred to the appropriate hearing health care professionals for further assessment.

Intermittent nature of music

The vast majority of the research in the area of hearing loss has been in the industrial/occupational domain. While it is known that occupational levels in excess of 85 dBA can permanently damage your hearing (and data exists that even levels above 80 dBA can be damaging to some), the levels from exposure to recreational noise such as music are not as well defined. An implicit assumption in all noise-exposure

continued on page 10

Music-Related Hearing Loss …

continued from page 9

research is that intermittent noise with regular quiet periods should be less damaging than steady-state noise. Various regulatory agencies and regulatory standards have handled this differently but how quiet do the spaces in between the noise (and music) bursts have to be for there to be a reduction in the level of damage? Since the dynamics of music is more variable than typical noise spectra, with music having intense periods followed by periods of relative quiet, this may result in a different exposure for music and noise of "equal intensities." This leads us to our first hearing loss prevention strategy …..

… "Hum while you work"

Humans (and all other mammals) have a small muscle in their middle ears (behind the eardrum) that contracts upon hearing loud sounds. From an evolutionary perspective, we have such a muscle so that our own voice would not be too loud for us. When this muscle (called the stapedius muscle) contracts, it pulls on the small chain of bones in the ear that conducts sounds, making these bones temporarily less efficient as conductors, hence providing some attenuation of ambient sounds. Borg et al. (1995) argued that the level of one's stapedial reflex, something that is routinely assessed in an audiology assessment, is the primary reason why some people are more susceptible to hearing loss than others, given the same noise source. If you know that a loud sound is about to occur, start humming before you encounter the loud sound, and try to sustain your humming until the noise is finished. Rock drummers have used this strategy for years, humming (and grunting) as they smash away at their drum sets. One unfortunate feature of the stapedius muscle is that it loses its efficiency after about 10-15 seconds. In an industrial environment, therefore, after 15 seconds of constant steady state noise, the stapedius muscle yields no further protection. However, music has loud and soft passages, and it is this intermittent loud/soft alteration of music that may allow the stapedius muscle to "reset" and once again provide protection for intense sounds.

Tuned hearing protection

Hearing protection has been available for years. It may not be the lawn mower or the chain saw that is the main source of noise exposure in your situation, but using hearing protection for these noisier recreational parts of life will afford you better hearing years later (assuming of course that you consider mowing your lawn to be recreational). Earplugs are usually small foam or soft plastic inserts that can be placed in the earcanal. Earmuffs that fit over the ear and are bulkier than earplugs, can also be quite useful for very noisy situations. Due to the laws of acoustics, hearing protection attenuates the shorter wavelength, higher frequencies more than their longer wavelength, low-frequency neighbors. Subsequently hearing protection treats different frequencies in different ways. This may be acceptable for many industrial workers, but is disastrous for many musicians. In the past 15 years, there have been a series of earplugs available that are ideal for listening to music. These "flat" or uniform attenuator earplugs lessen the sound or noise energy equally across the spectrum. Music still sounds like music, but without that "dead" feeling. Several manufacturers offer this flat earplug in both custom-molded and premolded versions.

Moderation

Another difference between industrial workers and musicians (with the exception of classical musicians who can be exposed many hours a week to their own instruments and those of their colleagues and students), is that most musicians don't work a 40-hour week. Musicians have the advantage of being able to rest for long periods of time in relative silence (as well as sleep in until noon each day!). This is not the case for industrial workers who may also go to rock concerts in their off hours. The loud concert could easily add to their total weekly dose of noise.

Permanent hearing loss starts as a series of temporary hearing losses. When you depart from a rock concert or other loud place, your hearing may be temporarily affected. One might notice this as a muffled or dead feeling in the ears, and there might be ringing in the ears. This temporary hearing loss resolves after about 16-18 hours. If exposure to the loud noise is repeated often enough, temporary hearing loss can become permanent. The strategy would therefore involve moderation. If you go to a rock concert on Friday night, don't mow your lawn Saturday. Wait until Sunday, or at least wear properly fitted earplugs or muffs, or better yet, get someone else to do it for you!

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UPCOMING OHC CERTIFICATION AND RECERTIFICATION COURSES* 2004

*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 February 2004 (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
4/1/2004	NC	Greensboro	Sarah E. Ervin	336-834-8775
4/5/2004	IL	Joliet	James J. Jerome	317-841-9829
4/13/2004	PA	Philadelphia	James B. Robertson	215-836-9923
4/13/2004	NC	Morrisville	Tamara H. Thompson	919-967-6064
4/14/2004	DC	Washington	Diane M. Brewer	202-994-7167
4/14/2004	CA	San Francisco	Kathryn M. Deppensmith	713-468-3201
4/14/2004	FL	Orlando	John H. Elmore	800-357-5759
4/14/2004	NC	Greensboro	Sarah E. Ervin	336-834-8775
4/16/2004	SC	Charleston	Stuart L. Cohen	843-797-0275
4/17/2004	FL	Miami	John H. Elmore	800-357-5759
4/19/2004	FL	Tampa	Harvey B. Abrams	727-398-6661
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Fall 2004 Course Director Workshops Scheduled

The Council will conduct the fall Course Director Workshop at the Sheraton Gateway Suites Hotel O'Hare on Friday, October 29, 2004.This workshop is a requirement for Course Director Certification upon application approval by the CAOHC Screening Committee.

Course Directors may continue to choose the workshop method for recertification through the end of 2004. 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.

Professional Supervisor Course Scheduled for AAA and AOHC

New federal recordkeeping and reporting requirements will stimulate interest in hearing conservation programs (HCPs) and will increase roles of audiologists and physicians as "Professional Supervisors" of HCPs. Audiologists and physicians who take on supervision of audiometric testing in such programs should be competent in "best practices" of hearing conservation. This skills-based training will provide a comprehensive tutorial on:

- Roles and responsibilities of the Professional Supervisor
- Elements and organization of successful hearing conservation programs
- Surviving new OSHA and MSHA recordkeeping regulations
- Latest tools to identify and prevent noise-induced hearing loss
- Guidelines for audiometric baseline revision and medical referral
- Managing "problem audiograms"

The Council will present a course titled: "The Professional Supervisor of the Audiometric Monitoring Component of Hearing Conservation Programs" prior to the American Academy of Audiology (AAA) convention on Wednesday, March 31, 2004 in Salt Lake City, Utah at the Marriott Salt Lake City Downtown Hotel. This course is directed to audiologists. The faculty will include Beth Cooper, INCE Bd. Cert, Richard Danielson PhD, and Robert Goldenberg, MD. Attendees will receive continuing education credits (applied for), a copy of the *Hearing Conservation Manual 4th Edition*, and unique training materials. Register online at: http://www.caohc.org/professional.html

A similar course for physicians will be conducted by CAOHC and sponsored through the American College of Occupational & Environmental Medicine (ACOEM) at the American Occupational Health Conference (AOHC) on Sunday, May 2, 2004 in Kansas City, Missouri. Select Session #1101 at: http://www.acoem.org/education/aohc2004/millennium_sun.asp

All inquiries may be directed to Barbara Lechner at info@caohc.org

For further information about the Professional Supervisor of the Audiometric Portion of the Hearing Conservation Program and Scope of Practice, visit the CAOHC website at: www.caohc.org and scroll to menu selection "The Professional Supervisor."

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