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UPDATE

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The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

Hearing Conservation for the Hearing-Impaired Worker

Introduction by Ted Madison

The prevalence of hearing loss among persons enrolled in occupational hearing conservation programs (HCPs) is difficult to determine. Recently, Tak and Calvert (2008) estimated that 11.4% of the overall US workforce reports having hearing difficulty of varying degrees and that approximately ¼ of the hearing difficulty reported can be attributed to employment. These estimates are based on analysis of data from the US National Health Interview Survey (NHIS) that were collected from 1997 to 2003. Hearing loss rates were found to vary significantly across industries with particularly high rates among workers in railroads, mining and primary metal manufacturing. (Tak and Calvert, 2008)

Those hearing-impaired workers deal with many of the same challenges as their normal-hearing co-workers: selecting the right hearing protectors, fitting them correctly, communication, and situational awareness. However, when the program doesn't work the way it should, the consequences faced by workers with hearing loss can be considerably more serious. While a 10 dB threshold shift may not even be noticed by someone with thresholds that are within normal limits, it may be devastating to the worker whose ability to communicate in noise is already significantly reduced. For the worker faced with the possibility that hearing loss may hinder him/her from being able to meet the requirements of the job, small changes in hearing may have a huge impact. Safety, job performance and the perceptions of co-workers may all be negatively affected by hearing loss.

Finding the right balance between communication and hearing protection is often a difficult task, regardless of hearing ability. When you add hearing loss and hearing aids to the situation, the task becomes much more complicated. If too little protection is provided in an attempt to enhance communication, the worker is at risk for additional noise-induced hearing loss and further degradation of communication. If too much hearing protection is provided, the combined effects of the hearing loss and the attenuation provided by the hearing protector may result in critical sounds and communication signals becoming inaudible.

I'm often asked what type of hearing protector is best for workers with hearing impairment. Considering that there is no 'best' HPD for all workers in any hearing category, it should come as no surprise that no single type of device will meet the needs of all those with hearing loss. What seems to be consistent, however, is that each case is unique, and that extra time and effort is required to help these workers find the right combination of protection, communication and auditory awareness. Consultation with an audiologist or other hearing health care professional is also an important step in most cases.

One valuable resource is the OSHA Safety & Health Information Bulletin (SHIB) titled "Hearing Conservation for the Hearing Impaired Worker" (OSHA publication 12-27-2005). We have reprinted it beginning on page 5 to provide an overview of OSHA's perspective on this issue as it relates to compliance with its Occupational Noise regulation, 29 CFR 1910.95.

Reference:

Tak, S. and Calvert, G. M. (2008). Hearing difficulty attributable to employment by industry and occupation: an analysis of the national health interview survey—United Sates, 1997-2003. J Occup Environ Med. 19 (2) 46-56.

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UPDATE
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Chair's Message

By Mary M. McDaniel, AuD CCC-A CPS/A
Pacific Hearing Conservation, Inc.
Representative of the American Speech-Language-Hearing Association

How effective is your Hearing Loss Prevention Program? What metrics are you using to assess effectiveness? Are you successful in your efforts? Have you confused compliance with effectiveness?

There are six elements for a Hearing Conservation Program as outlined in the OSHA noise regulation; noise monitoring, noise control, audiometric testing, hearing protection, employee training, and record keeping. If implemented properly, these six basic program elements should yield a compliant program. But, is a compliant program an effective program?

I have spoken for years about the elements of an effective hearing loss prevention program and have used the term "Synergistic Seven". Despite the fact there are only six elements outlined in the regulation, there is an extremely important element not listed. Without Program Evaluation, the seventh element, you will have very little chance of achieving effectiveness. If you merely go through the motions, check off the boxes, and store the results in the file drawer, you'll be compliant but probably not effective.

Every element is required and if the information gleaned from each element is used to its full potential, you have a chance for an effective program. The key is in seeing the value and necessity of every element and the importance of all six elements working together. There's little value in measuring noise in the workplace if there is no attempt to examine the feasibility of noise control. Doing an audiogram does not prevent noise induced hearing loss unless the results of the hearing tests are used to motivate and encourage workers. Providing hearing protection will not save hearing unless each worker is fitted with a protector that is appropriate for the noise level and more importantly, the worker is properly trained in how to fit and use the protector. Employee education and motivation will not protect or prevent anything unless it's meaningful, relevant, and there's an assessment of whether learning actually occurred. And if the primary focus of record keeping is the number of Standard Threshold Shifts or OSHA 'recordables', aren't you measuring your failure rate as opposed to success?

Each element of an effective program contributes to the whole. Noise measurement determines the direction for the rest of the program; the requirements and feasibility of noise control; who is required to be in the HLPP; what types and styles of hearing protectors are warranted. The audiometric test alone does nothing! No hearing loss is prevented nor are any ears protected by taking a hearing test. The audiogram, however, can be viewed as our report card. If the other elements of the program are working, it will be evident in the stable audiograms obtained though annual audiometry. Putting a box of earplugs by the time clock in no way promotes consistent or effective hearing protection use. It's necessary to have appropriate selection and fitting of hearing protection along with monitoring their use. And merely tracking the number of STSs or 'recordables' is like closing the gate after the horses are out! It's critical that you examine the records to help determine where your program is strong, where it is weak, and where to focus your energies and priorities for the program in the future.

The six elements of the hearing conservation program must be working together, each supporting the other. Program evaluation, the seventh element, is the one that will help determine your effectiveness. Look at your program, examine the test results, review your records, ask questions of the workers, and take the time to determine whether your efforts are successful. There's so much more to hearing conservation than hearing testing and earplugs! Don't fall short in your efforts. Employ the 'synergistic seven' to your advantage and always strive for an effective program rather than a compliant program. The comprehensive curriculum of your CAOHC training stresses the importance of each and every element of an effective hearing loss prevention program. Use what you've learned and strive for excellence. CAOHC – there is no equal!

OHC Corner

Otoscopic Screening

In this issue we reach back to November 1993 for a concise, to-the-point article by former Council member, Robert Dobie, M.D., whom you may recognize as the expert who provides a review of anatomy, physiology and diseases of the ear in the widely used CAOHC video on this subject. Despite the dramatic changes in the functionality and variety of audiometric equipment since 1993, the fundamental aspects of good otoscopic screening have not changed. Although video otoscopes have also come a long way since then, the doubts that Dr. Dobie raises about the usefulness of video otoscopy for occupational screening seem well founded.

Otoscopy in Hearing Conservation Programs

Robert A. Dobie, MD

Although it is not required by the 1983 OSHA Hearing Conservation Amendment, most hearing conservationists (OHCs) perform an otoscopic examination prior to pure-tone audiometric testing. Should otoscopy be part of the audiometric program? What is a reasonable goal for otoscopy by the OHC? What equipment and procedures are appropriate? Each of these questions merits a brief discussion.

The advantages of otoscopy would seem obvious. The OHC will usually be able to see the tympanic membrane, confirming that the ear canal is not obstructed by cerumen. Cerumen impactions and other abnormalities can be detected, providing potentially useful information for the supervising audiologist or physician who will review the audiometric data. In addition, cerumen impactions can interfere with proper use of insert hearing protectors.

There are several disadvantages, however. Accurate otoscopy is not easy and OHCs are unlikely to correctly identify conditions such as tympanic membrane perforation and otitis media. Some abnormalities, such as blood or pus in the ear canal, are obvious; in fact, the worker will usually be aware of these. Others, such as redness and swelling, can be subtle. OHCs will often misread these. Two kinds of errors occur and each has consequences for the worker. First, if the OHC fails to detect or identify a significant abnormality, the worker may go away with a false sense of security, and may fail to seek medical attention promptly when serious symptoms arise. Second, if the OHC thinks there is an abnormality when the ear is really normal, the worker will suffer needless anxiety until a subsequent medical examination provides reassurance.

Goal of Otoscopy

The OHC should try to answer one simple question: is the tympanic membrane visible? Even if only part of the eardrum can be seen, sound can reach the middle ear, and audiometry can proceed. If the drum cannot be seen, the program supervisor's policy may call for the OHC to proceed with audiometry (after noting the otoscopic finding) or may require medical referral for cerumen removal or other medical

treatment prior to audiometry. In my opinion, this is the only appropriate goal for otoscopy by the OHC.

Equipment

A conventional battery-powered or rechargeable otoscope will suffice. Specula of various sizes should be available. If disposable specula are not used, specula will need to be washed, soaked in disinfectant, rinsed and air dried between examinations.

Video otoscopes have recently become available, with a tiny built-in video camera that projects to a TV monitor screen, permitting others to see the same image as the examiner.

The video otoscope is a marvelous, but expensive, teaching tool; allowing doctors to demonstrate abnormalities to patients, families, and students. It would be useful for teaching otoscopy in an OHC certification course. The video otoscope, however, does not help the examiner see (or understand) things he or she cannot see with an ordinary otoscope. It's hard to imagine how the video otoscope could be appropriate for use by an OHC in the conduct of the audiometric program. Indeed, it could do more harm than good, by making a simple screening procedure seem more sophisticated and accurate than it is.

Procedures

Select the largest speculum that will fit in the ear canal, to permit maximum illumination. The pinna should be grasped with the free hand and pulled up and back to straighten the ear canal. If this or any other part of the examination causes pain, stop. Otherwise, gently insert the speculum into the ear canal and attempt to visualize the eardrum. If the drum can't be seen, the OHC should follow a predetermined protocol, either referring the worker or proceeding with audiometry.

Conclusions

1) Otoscopy by the OHC has one main goal: to determine whether the tympanic membrane can be seen.

2) Otoscopy by the OHC is not a clinical diagnostic test and the OHC should not attempt to identify abnormalities. If something doesn't look right, report it to the physician or audiologist supervisor.

3) A simple otoscope is the appropriate tool for OHC otoscopy; the video otoscope has no place in the OHC's hands, outside of the training course.

U. S. Department of Labor
Occupational Safety and Health Administration
Directorate of Science, Technology & Medicine
Office of Science and Technology Assessment

Hearing Conservation for the Hearing-Impaired Worker

Safety and Health Information Bulletin

SHIB 12-27-2005

Introduction

Hearing-impaired workers face many challenges in the workplace, including communication, identifying and using suitable hearing protection and the use of hearing aids at work. Industrial hearing conservation programs may not fully address the specific needs of hearing-impaired workers for hearing protection and communication. This Safety and Health Information Bulletin (SHIB) focuses on how hearing conservation programs can address the needs of hearing-impaired workers who are exposed to high levels of noise in their workplace. For additional information on workplace accommodations for hearing-impaired workers for emergency preparedness/response and workplace safety in general, please refer to " Innovative Workplace Safety Accommodations for Hearing-Impaired Workers," SHIB 07-22-2005 at http://www.osha.gov/dts/shib/shib072205.html.

Purpose

The purpose of this SHIB is to raise awareness about issues associated with protecting hearing-impaired workers in noisy environments and to provide employers, workers and professional organizations guidance on accommodating hearing-impaired individuals in the workplace when exposed to high levels of noise. Specifically, this SHIB:

1. Informs employers that specialized hearing protectors are available that may benefit occupationally exposed hearing-impaired workers in a variety of noisy workplaces;
2. Encourages employers to work as a team with hearing-impaired workers and the professional in charge of the hearing conservation program to determine the appropriate hearing protection for the hearing-impaired employee, and to determine on a case-by-case basis whether the worker's hearing aid can be appropriately worn in a noisy workplace under an earmuff;
3. Informs employers and hearing-impaired workers that individualized audiometric testing protocols may be necessary to obtain valid audiograms.
4. Raises awareness about the need to protect the residual hearing of workers with hearing loss.

Hearing Conservation Issues Relating to Hearing-Impaired Workers

Use of Hearing Protection

OSHA's occupational noise exposure standard includes requirements for hearing protection as part of the employer's hearing conservation program (29 CFR 1910.95(i)). It requires employers to make hearing protectors available to all employees exposed to an 8-hour time-weighted average (TWA) sound level of 85 decibels (dBA) or greater. It also requires that hearing protectors be worn by employees exposed to an 8-hour TWA of 85 dBA if they have experienced a standard threshold shift (STS). Hearing protectors are also required to be used prior to receiving a baseline audiogram, and as required by 29 CFR 1910.95(b)(1). Employees must be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer. The employer must ensure proper initial fitting and supervise the correct use of all hearing protectors. The employer must also evaluate the protector's attenuation for the specific noise environments in which the protector will be used.

This Safety and Health Information Bulletin is not a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. Pursuant to the Occupational Safety and Health Act, employers must comply with hazard-specific safety and health standards promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement any recommendations in this Safety and Health Information Bulletin is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

The use of hearing protection in the workplace is of special concern to workers who already have hearing loss. Hearing-impaired workers can have difficulty hearing co-workers, verbal instructions, the sound of machinery, or they may lack the ability to identify the direction of a sound source. Hearing-impaired workers may experience difficulty in using hearing protectors because conventional hearing protectors may reduce the speech volume level below the person's threshold of audibility, especially for the important middle to higher frequency consonant sounds [3]. Manufacturers are continually designing and upgrading specialized hearing protectors for industrial, military, law enforcement, and fire and rescue team use. These may also benefit occupationally exposed hearing-impaired workers in a variety of noisy workplaces. Some of these innovative protectors are suitable for the hearing-impaired worker because they provide better clarity for speech recognition and communication, while still providing adequate protection in noisy environments by keeping the sound that reaches the ear at a safe level [1]. As manufacturers respond to the need, a number of affordable hearing protection options are emerging that allow hearing-impaired workers to function safely and effectively in noisy environments without the risk of further hearing loss [2].

Although workers with hearing impairment have lost part of their hearing ability, OSHA 29 CFR 1910.95(c) provides for protection of their residual hearing ability. Even employees who have been diagnosed with severe or profound deafness may have some residual hearing that needs to be protected from additional loss. Therefore, OSHA has taken the position that the requirements for using

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hearing protection in accordance with 29 CFR 1910.95(b)(1) and 1910.95(i)(2) apply to deaf employees. The Agency has stated that "there is no exception (for hearing protection) for employees who have diminished capacity to hear or for employees who have been diagnosed as deaf." OSHA Letter of Interpretation, Tekla A. Staley, August 3, 2004 http://www.osha.gov/pls/oshaweb/ owadisp.show_document?p_table=INTERPRETATIONS&p_id=24980

Specialized hearing protectors

Specialized hearing protectors include passive (no electronics or amplification), active (a power supply and electronics), or communication headsets.

Passive hearing protectors

Flat or uniform-attenuating hearing protectors use mechanical means to filter the sound and provide nearly equal attenuation across the audible frequency range. In general, the signal sounds more natural, clearer and less distorted than the sound from conventional hearing protectors which often provide greater attenuation in the higher frequencies. When 2 properly fitted, passive hearing protectors can provide adequate protection and users can hear more clearly and thus feel less isolated on the job. Workers with high frequency hearing losses may find these beneficial [3,4].

Active hearing protectors

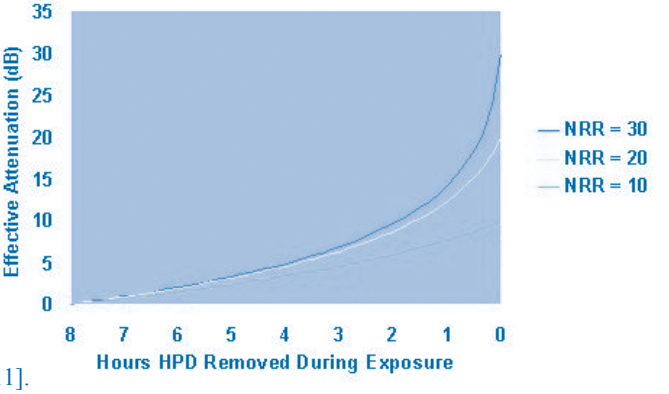
"Level dependent" (also known as sound restoration) hearing protectors not only block sound but use electronic circuitry to transmit low-level sounds through the hearing protector. They amplify incoming sounds up to a specified sound level depending on the model and type of hearing protector. Above the specified level, the electronic input is automatically reduced so that the protector no longer provides amplification which could lead to overexposure. An advantage of these protectors is that during quiet time and intermittent noise there is no need to remove the hearing protector to hear well [3,4].

Earmuffs with communication features are also available. These devices are designed with wireless (FM or infrared) or wired technology for-one or twoway communication systems. The devices provide specialized electronic circuits to limit the incoming sounds so that the earphones themselves do not create sound levels that are hazardous to the wearer [3,4].

In extremely high noise levels, dual hearing protection (such as an earplug under an earmuff) equipped with electronic/communication features may permit clearer communication without sacrificing attenuation. [3].

For more information on available hearing protectors, the National Institute for Occupational Safety and Health (NIOSH) has an online compendium of hearing protection devices. The listing is provided at http:// www.cdc.gov/niosh/topics/noise. Additionally, the U.S. Department of Labor's Office of Disability Employment Policy Technical Assistance Program's Job Accommodation Network (JAN) has a Searchable Online Accommodation Resource (SOAR) feature that lists hearing protector manufacturers that have provided information to that network. Neither OSHA nor JAN recommends or endorses any company's products. However, JAN has valuable information on the availability of specific hearing protectors for use with the hearing-impaired population. The listing is provided at http:// www.jan.wvu.edu/cgi-win/OrgQuery.exe?Sol541.

Many workers have strong preferences for a particular type of hearing protector because of comfort, fit, and communication demands. Experience has shown that the effectiveness of hearing protection is diminished if it is removed for even a short period of time [3,11]. Therefore, comfort, communication, and hearing protectors that allow for necessary jobrelated hearing is key to their preventive effect and the actual protection received [3]. The right hearing protector is one that is consistently worn. The graph below depicts the relationship between effective hearing protection attenuation and the amount of time hearing protection is worn.



[11].

Selecting and Fitting Hearing Protection Devices

29 CFR 1910.95(i)(3) states that "employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided

by the employer." The phrase "suitable hearing protectors" has been interpreted to mean protectors that are comfortable to wear and that offer sufficient attenuation to prevent hearing loss. OSHA Letter of Interpretation, Danny D. Anderson, September 30, 1983 http://www.osha.gov/pls/oshaweb/ owadisp.show_document?p_table=INTERPRETATIONS&p_id=19149 3 [11].

In general, "employers are advised to give workers a choice between at least one type of earplug and one type of muff; . . . the number of different hearing protectors required to constitute an adequate variety is simply the number needed to supply each employee that requires a hearing protector a suitable one." OSHA Letter of Interpretation, G.A. Brown, October 17, 1983 http://www.osha.gov/pls/oshaweb/ owadisp.show_document?p_table=INTERPRETATIONS&p_id=19154

To motivate workers to consistently wear hearing protectors in noisy situations, employers should engage workers in determining their individual hearing protector needs. An employer should also consider referring a worker with a hearing impairment for a one-on-one consultation with a qualified hearing conservation professional to determine the most suitable hearing protector for the particular working environment. Important considerations for selecting the appropriate hearing protector include the worker's hearing and noise exposure levels, job assignment, job-related hearing requirements, communication requirements and environmental considerations. The chosen hearing protector must provide the needed amount of attenuation specific to each worker's noise exposure situation. Over attenuation (blocking too much sound) can produce undesirable and unnecessary interference with speech and warning signals [5].

More information on the selection of hearing protectors and OSHA's requirements for a hearing conservation program can be found on the OSHA website at http://www.osha.gov. The website will direct you to standards, letters of interpretation, technical guidance documents and informational pamphlets. NIOSH also has a wide variety of information on noise and hearing loss and has a dedicated website for Noise and Hearing Loss Prevention at http://www.cdc.gov/niosh/topics/noise. Hearing Aid Usage in Industry

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Some hearing-impaired workers who wear hearing aids want to be able to continue to wear hearing aids in their workplaces even when exposed to high levels of noise. They feel that with the hearing aid they can communicate better with co-workers, are able to better localize sound, and can hear warning or equipment sounds. Hearing aids, however, in addition to amplifying useful sounds also amplify unwanted background noise [4]. As demonstrated in both laboratory and site measurements, noise amplified by hearing aids may exceed the OSHA 8-hour permissible limit of 90 dBA [6,7].

Consequently, hearing aids should not be worn in areas with hazardous noise [2,6,7]. However, on a case-by-case basis, hearing aids can be worn underneath an earmuff [7,12]. The hearing conservation professional, overseeing the hearing conservation program should be consulted to evaluate and manage these situations on a case-by-case basis to ensure no further change in hearing occurs.

Workers have suggested that they want to wear their hearing aids at work in the turned-off position in lieu of using hearing protection since they are accustomed to their own earmolds, and the hearing aid is already in their ear. Hearing aids are not hearing protectors. Hearing aids turned off do not provide enough blockage of sound to act as hearing protection, but may reduce the sound enough to prevent the worker from hearing warning signals or other essential sounds [2]. OSHA has stated that employees with "a diminished capacity to hear cannot satisfy the requirement to wear hearing protection simply by turning off their hearing aids when working in a high noise area. Hearing aids are not hearing protectors." OSHA Letter of Interpretation, Tekla A. Staley, August 3, 2004 http://www.osha.gov/pls/oshaweb/ owadisp.show_document?p_table=INTERPRETATIONS&p_id=24980.

Individual evaluation by a qualified occupational hearing conservation professional and following-up with the employee at the worksite will ascertain the suitability of the hearing aid and/or hearing protector for that particular employee's noise environment.

Audiometric Testing Requirements

For the purpose of determining whether an employee has a standard threshold shift (STS), the hearingimpaired employee must remove his/her hearing aid and be tested with the appropriate headphones and procedures specified in the hearing conservation standard, 29 CFR 1910.95(h)(1)-(h)(5); audiometric test requirements. Considerations for testing hearingimpaired employees may include switching from an automatic testing technique (with a microprocessor audiometer) to a manual technique to obtain valid thresholds. This may be necessary due to the degree of hearing loss or other confounding factors such as ringing in the ears. Also, "employees with hearing aids should keep the aids on during the audiometric test instructions", and, " hearing aids should, of course, be removed after the instructions have been given" [5]. Some hearing-impaired workers may need to be referred for further evaluation and testing if a valid audiogram can not be obtained on-site [5].

The correct approach to address these challenges will depend on facts specific to each individual situation, and should be resolved by collaborative teamwork involving the employer, the hearing-impaired employee and the hearing conservation professional [6,7].

Conclusion

The recommendations provided in this bulletin offer guidance on addressing the special needs of hearingimpaired workers to protect their hearing in high noise environments. The risk of miscommunication, injury, and other challenges presented to the hearing-impaired employee in the workplace can be minimized through the implementation of certain practical steps. These include but are not limited to:

- awareness that hearing-impaired workers may have special needs to protect their hearing,
- providing information,
- soliciting input,
- providing choices,
- team collaboration to ascertain individual workplace needs, and
- referral for further evaluation, as appropriate.

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3) The Noise Manual, Fifth Edition, Chapter 10, Hearing Protection Devices, Elliott Berger, May 2000, AIHA, Fairfax, Va.

4) Encyclopedia of Acoustics, "Hearing Protection Devices", ISBN 0-471-80465-7, 1997 John Wiley & Sons, Inc., and the 2004 TeleWeb Virtual Seminar Series, New Developments in Hearing Protection, with an Update on Ratings and Specialized Types of HPDs, July 27, 2004, Elliott Berger.

5) Council for Accreditation in Occupational Hearing Conservation (CAOHC) Manual, Chapters 7,The Audiometric Testing Program, Chapter 8, Understanding the Audiogram and Follow-Up Procedures, and chapter 10, Hearing Protectors.

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8) EARLog #18, "Can Hearing Aids Provide Hearing Protection?" Elliott Berger, E-A-R, Indianapolis, Ind.

9) Responses to NHCA/OSHA Alliance Questionnaire on Application of Accommodations to hearing conservation practices.

10) U.S. Department of Labor/OSHA. http://www.osha.gov.

11) http://www.michaelassociates.com

12) National Hearing Conservation Association, comments provided.

Other Useful Resources

The Office of Disability Employment Policy offers the following technical assistance programs: Training and Technical Assistance to Providers (T-TAP) http://www.t-tap.org, The National Center on Workforce and Disability for Adults http://www.onestops.info/, and the National Collaborative on Workforce and Disability for Youth (NCWD/Youth) http://www.ncwd-youth.info/.

Job Accommodation Network's Searchable Online Accommodation Resource, (SOAR) for Hearing Protectors http://www.jan.wvu.edu/cgi-win/OrgQuery.exe?Sol541

The National Hearing Conservation Association, (NHCA) http://www.hearingconservation.org/as_aboutHearingCons.html

The American Academy of Audiology, (AAA)

http://www.audiology.org/consumer/

American Speech-Language-Hearing Association, (ASHA) http://www.asha.org/public/

National Institute for Occupational Safety and Health,

(NIOSH) http://www.cdc.gov/niosh/topics/noise

National Institute on Deafness and Other Communication Disorders, (NIDCD) Wise Ears campaign- http://www.nidcd.nih.gov

For educational information on hearing conservation, visit E-A-R Hearing Conservation, http://www.e-ar. com/hearingconservation

The Better Hearing Institute, http://www.betterhearing.org/research/factoids.cfm

For information on innovations in technology and hearing conservation, you may visit Hearing Products Report. The web address is: http://www.hearingproductsreport.com/departments.ASP?Dept=H0509ll.

Do Earplugs Help Relieve Ear Discomfort In Flight?

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Use of earplugs in flight in both jets and commuter aircraft can provide a more relaxing and enjoyable experience, and improve one's ability to ignore distracting/annoying noises and conversations, to be better able to work or sleep. Many types of earplugs can provide these benefits. The purpose of this article is to discuss potential safety concerns that may arise from such use due to changes in cabin pressure, and whether earplugs may exacerbate or mitigate such issues.

Noise Reduction

Noise levels on jet aircraft generally range from the upper 70-decibel (dB) range to the lower 80s, although in the aft end of rear-engine jets the sound levels can be even higher. Though generally not hazardous to one's hearing for the durations typically encountered, these levels can be annoying and fatiguing. However, noise levels on small commuter aircraft can be even higher, sometimes approaching the hazardous range. When worn properly, earplugs can provide consistent and achievable hearing protection in these environments.

Pressure Relief

Another feature of air flight is the change in cabin pressure due to ascent or descent, or loss of pressurization. Changes in cabin pressure will affect the air contained within the middle ear cavity exerting force on the eardrum. Cabin pressure changes may also affect the eardrum from the other side if air is entrapped within the ear canal by the presence of an earplug.

Generally, notable or serious problems only occur during descent, since under conditions of either ascent or loss of pressure while at altitude, the changes in ambient pressure are in the direction of a decrease rather than an increase. In the case of ascent the pressure in the middle ear or under the plug (i.e., between the plug and the tympanic membrane) is greater than ambient, and air simply passes out of the system. This occurs since the Eustachian tube (which connects the throat and sinuses to the middle ear) allows air to pass outwards relatively easily, like air being expelled from a balloon. For earplugs, pressure can be released by the plug either backing out of the earcanal or breaking its seal, or through the plug itself if its materials or construction are designed with that in mind.

However, under conditions of descent, and especially in the extreme case of rapid and uncontrolled descent, problems can arise. Air does not easily pass into the middle ear through the Eustachian tube (like trying to inflate a new and tight balloon). As a result, the pressure in the middle ear may be lower than ambient.

Situation 1: No earplugs are worn

In the case of an unplugged ear, a pressure differential will arise across the tympanic membrane (due to the increasing pressure in the ear canal) causing the drum to bulge inward. This can be painful and in extreme cases, such as rapid descent from 18,000 feet to sea level, a difference in pressure of half an atmosphere could be produced. The eardrum would be forced in with a pressure equal to that of a column of mercury 380 mm (~15 in.) high, causing a rupture.

Eardrum ruptures, although dramatic and painful, usually heal spontaneously if kept clean, and protected from infection. Typically there will be no resultant permanent impairment of hearing.

Situation 2: Wearing Tightly Sealed Earplugs

When an ear is plugged with a premolded earplug, or other type of insert that causes a pneumatic (airtight) seal, an additional chamber of entrapped air is created between the earplug and eardrum, along with air in the middle ear cavity. During descent, when ambient pressure increases, the plug will be forced inwards since the air cannot pass the plug. This can be painful and make the plug more difficult to withdraw. Hematomas of the canal lining may result. However, eardrum rupture is still unlikely to occur. As long as the wearer can reach the plug to withdraw it and break the seal, no discomfort should result.

Situation 3: Wearing Earplugs that Allow Pressure Equalization

The preferred case is a plug that "leaks," i.e. an earplug that blocks sound waves but at the same time allows a measured passage of air into the ear canal to limit the rate of increase of pressure on the outside of the eardrum. Vinyl foam earplugs or specially designed earplugs with pressure regulating mechanisms help provide this type of slow leakage. In the case of the foam earplug, the leakage is between the foam and the surrounding ear canal surfaces and/or through the foam itself. In the case of the specialized earplugs, an internal filter element allows a slow equalization of the pressure on each side of the plugs. Therefore these plugs do not create an airtight seal. This assures the best safety and comfort in flight, as is supported (in the case of vinyl foam earplugs) by over 30 years of experience in the U. S. Air Force (Berger and Gasaway, 1990).

Anecdotal evidence suggests that some passengers may even experience less ear discomfort with these slowly leaking earplugs than when no earplugs are worn at all. This presumably occurs because these plugs reduce the rate of change of pressure that is experienced in the earcanal. In turn this provides more time for the eustachian tube to balance the pressure in the middle ear in order to equalize the force on the two sides of the eardrum. For this function to be effective, the plugs must be inserted while at maximum altitude before descent begins. Better yet wear them for the entire flight to fully benefit from possible benefits during ascent, and from the noise reduction that they provide.

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Resources for Course Directors

CAOHC continues to find new ways to enhance the resources and material available to Course Directors for teaching their Occupational Health Conservation (OHC) Courses.

OHC Curriculum PowerPoint ® Presentations

Five sets of PowerPoint ® presentations and notes are available for purchase. Each set contains a CD with ready to use presentations, speaker notes and directions for displaying animation and sound files.

The topics covered are:

1) Noise Exposure Evaluation and Noise Control
2) The Physics of Sound
3) Introduction to Hearing Conservation (new for 2008)
4) The Role of the Occupational Hearing Conservationist (new for 2008)
5) Regulations and Compensation (new for 2008)

These presentations can be modified/adopted into your own PowerPoint® template or used "as is" to cover the required topics for OHC Courses. These presentations can be purchased for $35 each at http://www.caohc.org/course_directors/powerpoint.php or by contacting the CAOHC office at 414-276-5338. Note: These presentations may not be used to help fulfill the requirement that approved OHC courses include 3 instructors representing at least 3 professional disciplines.

Anatomy, Physiology and Disease of the Human Ear Video/Curriculum Package

This video is narrated by Robert Dobie, MD, author of the book Medical-Legal Evaluation of Hearing Loss. The package includes a 22 minute video tape/DVD written and produced by CAOHC and supplemental materials that will help you involve your students, health staff, industrial workers, and others. The video/curriculum package is offered at a discounted rate of $200 for Course Directors and $300 for the public. The package can be purchased at http://www.caohc.org/publications/video.php or by contacting the CAOHC office at 414-276-5338. Note: This video can be used as a replacement for one of the required speakers needed to teach a CAOHC course.

4th Edition CAOHC Hearing Conservation Manual

CAOHC is the best source for the 4th Edition, Second Printing of the CAOHC Hearing Conservation Manual. If you are a member of a hearing conservation team in industry, military, mining – including occupational hearing conservationists, audiologists, physicians, industrial engineers, safety engineers, and others – this manual will assist in the front-line defense against hearing loss in your workers. The manual is $75 each, which includes shipping and handling (not including international) and is discounted for bulk purchases. For more ordering information go to http://www.caohc.org/publications/manual.php or contact the CAOHC office at 414-276-5338.

Additional Online Resources

The CAOHC website also offers a variety of articles, tools, links and other resources free of charge to Course Directors for use in their CAOHC OHC courses. Go to www.caohc.org and click on the "Teaching Tools" link on the left hand menu for additional resources. You can also find archived copies of the UPDATE newsletter at http://www.caohc.org/updatearticles/. These articles provide up to date information and research about a variety of hearing conservation topics that may be useful in preparing for your course or distributing to your students.

CAOHC always welcomes feedback and advice. If you have further suggestions, recommendations or comments, please feel free contact us at info@caohc.org or 414-276-5338. We look forward to further assisting in enhancing your OHC courses in the future.

Standards News

Revised Test Methods for Hearing Protectors

ANSI/ASA S12.6-2008

The Acoustical Society of America (ASA) has published a revised American National Standard, "Methods for Measuring the Real-Ear Attenuation of Hearing Protectors, ANSI/ASA S12.6-2008". It contains significant changes to the previous edition of the standard, published in 1997.

One of the hearing protector fitting procedures, Method A, described in the new standard is expected to be the procedure specified by the United States Environmental Protection Agency (EPA) for testing hearing protectors to determine the Noise Reduction Rating (NRR) when the EPA publishes a proposed new rule late in 2008.

The standard specifies laboratory-based procedures for measuring, analyzing, and reporting the passive noise-reducing capabilities of hearing protection devices. The procedures consist of psychophysical tests conducted on human subjects to determine the real-ear attenuation measured at hearing threshold. Two fitting procedures are provided: Method A) trained-subject fit, intended to describe the capabilities of the devices fitted by thoroughly trained users, and Method B) inexperienced-subject fit, intended to approximate the protection that can be attained by groups of informed users in workplace hearing conservation programs. Regardless of test method, the attenuation data will be valid only to the extent that the users wear the devices in the same manner as during the tests. This Standard does not address issues pertaining to computational schemes or rating systems for applying hearing protector attenuation values (see ANSI/ASA S12.68), nor does it specify minimum performance values for hearing protectors, or address comfort or wearability features.

For more information visit the ASA website http://asa.aip.org or contact them by phone at (631) 390-0215.

Research Notes

OHSU Grows Hair Cells Involved Hearing

08/27/08 Portland, Ore.

Oregon Health & Science University scientists have successfully produced functional auditory hair cells in the cochlea of the mouse inner ear. The breakthrough suggests that a new therapy may be developed in the future to successfully treat hearing loss. The results of this research will be published online this week by the journal Nature.

"One approach to restore auditory function is to replace defective cells with healthy new cells," said John Brigande, Ph.D., an assistant professor of otolaryngology at the Oregon Hearing Research Center in the OHSU School of Medicine. "Our work shows that it is possible to produce functional auditory hair cells in the mammalian cochlea."

The researchers specifically focused on the tiny hair cells located in a portion of the ear's cochlea called the organ of Corti. It has long been understood that as these hair cells die, hearing loss occurs. Throughout a person's life, a certain number of these cells malfunction or die naturally leading to gradual hearing loss often witnessed in aging persons. Those who are exposed to loud noises for a prolonged period or suffer from certain diseases lose more sensory hair cells than average and therefore suffer from more pronounced hearing loss.

Brigande and his colleagues were able to produce hair cells by transferring a key gene, called Atoh1, into the developing inner ears of mice. The gene was inserted along with green florescent protein (GFP) which is the molecule that makes a species of jellyfish glow. GFP is often used in research as a "marker" that a scientist can use to determine, in this case, the exact location of the Atoh1 expression. Remarkably, the gene transfer technique resulted in Atoh1 expression in the organ of Corti, where the sensory hair cells form.

Using this method, the researchers were able to trace how the inserted genetic material successfully led to hair cell production resulting in the appearance of more hair cells than are typically located in the ears of early postnatal mice. Crucially, Dr. Anthony Ricci, associate professor of otolaryngology at the Stanford University School of Medicine, demonstrated that the hair cells have electrophysiological properties consistent with wild type or endogenous hair cells, meaning that the hair cells appear to be functional. Based on these data, the scientists concluded that Atoh1 expression generates functional auditory hair cells in the inner ear of newborn mammals.

"It remains to be determined whether gene transfer into a deaf mouse will lead to the production of healthy cells that enable hearing. However, we have made an important step toward defining an approach that may lead to therapeutic intervention for hearing loss," Brigande said.

In Memoriam

Joseph Sataloff, M.D., D.Sc.

1919 – 2008

Joseph Sataloff was Professor of Otolaryngology at Jefferson Medical College, Adjunct Professor at Drexel University College of Medicine and author of more than 150 publications including eleven books. He was one of the first specialists in ear surgery, and performed approximately 20,000 microsurgical ear operations on patients from around the world. He was also widely recognized as an early leader in the field of Occupational Hearing Loss. His first book on that subject in 1957 was an important contribution in the early stages of hearing conservation, and he served in leadership roles throughout his career including as scientific advisor to President Nixon on the Occupational Safety and Health Act (OSHA). His efforts have contributed to hearing preservation for millions of American workers. He remained active as a physician and consultant until he was hospitalized two weeks before his death.

Joe Sataloff was also recognized internationally as a collector of and expert on antique jewelry, a subject on which he published two books, including a definitive work on Art Nouveau jewelry, his area of greatest interest. Portions of the collection he created with his wife, son and daughter have been displayed at major museums, and he donated exceptional art that is in the permanent collections of several eminent institutions including the Philadelphia and Boston Museums of Art and the Smithsonian Institution.

Dr. Sataloff was a medical officer in the Navy for 7 ½ years during World War II. He served with the Third Marine Division. During his twenty-eight months stationed on Guam, Sataloff (himself an Eagle Scout), founded the Boys Scouts of Guam. The organization still survives, and he remained in contact with some of the boys he helped, including one who went on to become Governor of Guam.

Dr. Sataloff was a graduate of West Philadelphia High School and the University of Pennsylvania, and he lived in Bala-Cynwyd from 1952 until his death. He was active in Big Brothers, the Boy Scouts, the Union League and many other organizations in Philadelphia. He was beloved for his infectious enthusiasm and ready wit. He is survived by his wife Ruth, son Robert, daughter Jody, daughter-in-law Dahlia, and five grandchildren Jeremy, Jamie and Daniel Cluchey, and Benjamin and Johnathan Sataloff. His son, Robert, currently serves on the CAOHC Council representing the American Academy of Otolaryngology-Head and Neck Surgery.

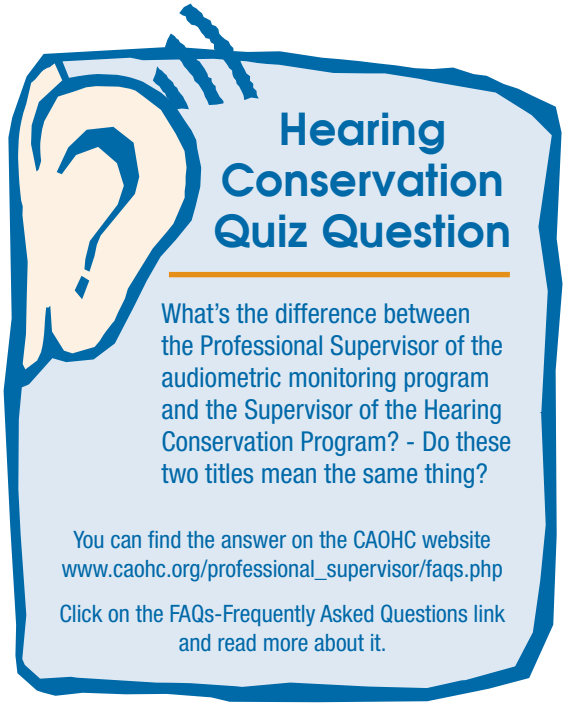
In lieu of flowers, Dr. Sataloff requested contributions be sent to the American Institute for Voice and Ear Research, 1721 Pine Street, Philadelphia, PA 19103.

Upcoming 2009 Certification Workshops for Course Directors

The Course Director (CD) is the individual responsible for planning and conducting training courses for OHCs. The Director is responsible for ensuring that specific CAOHC guidelines are followed and for determining the qualifications and competence of participating faculty members. Course Director certification and recertification is granted for a five-year period.

Date: Tuesday, February 10, 2009
Location: Sheraton Atlanta, Atlanta, GA
Prior to the 2009 National Hearing Conservation (NHCA) Conference

This workshop is a requirement for certification of new and recertifying Course Directors. Attendees are to submit an application and fee for approval by the CAOHC Screening Committee prior to the workshop. An additional workshop registration application fee is applicable.
Other upcoming 2009 CD Workshops can also be found on our website. Look for more information in early 2009 about our November 2009 workshop in Rosemont, IL. All questions may be directed to Chris Whiting, at 414/276-5338. Application and registration is available on-line at http://www.caohc.org/workshop/



Upcoming 2009 Professional Supervisor Courses

This one-day Professional Supervisor (PS) course is designed for audiologists and physicians who are seeking instruction in the role and scope of practice of the professional supervisor of the audiometric monitoring component of hearing conservation programs.

Date: Wednesday, April 1, 2009
Location: Dallas Convention Center, Dallas, TX
Prior to the AAA - AudiologyNOW! 2009 Conference

The Professional Supervisor of the Audiometric Monitoring Program in a Hearing Conservation Program may be an audiologist, otolaryngologist, or other physician. This professional supervisor plays a critical role in ensuring the effectiveness of a hearing conservation program; working in conjunction with other professionals, including Occupational Hearing Conservationists (OHCs), Industrial Hygienists, Safety professionals, employers, and employees and their representatives.

Individuals seeking national certification by CAOHC as a Professional Supervisor (CPS/A) must complete an application, on-line exam and submit a test case within 30 days of the course completion. This certification will confirm your advanced training in audiometric issues in occupational hearing conservation as a Professional Supervisor.

To register for the April 2009 PS course, you must attend the AudiologyNOW! 2009 Conference. The PS Course will be offered as a Learning Lab through the conference. Also, visit us online for other upcoming 2009 PS courses. They be found on our website. Look for more information in early 2009 about our November 2009 course in Rosemont, IL. For more information visit us online at: www.caohc.org/professional_supervisor/course.php

Do Earplugs Help Relieve Ear Discomfort In Flight?...

continued from page 7

Conclusion

Earplugs are not only safe and comfortable for use in flight, but can be recommended for protection from noise for a more enjoyable flight experience. In the case of foam earplugs and specially designed filtered earplugs, they may even reduce discomfort due to pressure changes in the aircraft cabin.

Reference:

Berger, E. H. and Gasaway, D. C. (1990). Use of earplugs in flight. E-A-R 90-6/HP, Aearo Technologies, Indianapolis, IN.

UPCOMING OHC CERTIFICATION AND RECERTIFICATION COURSES* 2008

*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 November 2008, the list provided below is a sample of OHC Courses and is not meant to be extensive.
Please visit our website for a current and complete list at www.caohc.org.

Begin Date	State	City	Course Director	Phone
11/3/2008	DC	Washington	Diane Brewer	202-994-7167
11/3/2008	KS	Overland Park	Tamara Thompson	913-375-4411
11/4/2008	DC	Washington	Diane Brewer	202-994-7167
11/5/2008	MA	Auburn	Steven Fournier	508-832-8484
11/5/2008	MD	Baltimore	Timothy Swisher	412-367-8690
11/5/2008	MO	St Louis	James Jerome	317-841-9829
11/5/2008	WI	Green Bay	Paul Kurland	920-499-6366
11/6/2008	KS	Overland Park	Tamara Thompson	913-375-4111
11/6/2008	MD	Baltimore	Timothy Swisher	412-367-8690
11/6/2008	MO	St Louis	James Jerome	317-841-9829
11/6/2008	WI	Green Bay	Paul Kurland	920-499-6366
11/10/2008	GA	Atlanta	Herbert Greenberg	678-352-0312
11/11/2008	GA	Atlanta	Herbert Greenberg	678-352-0312
11/12/2008	IA	Des Moines	Christine Pernetti	319-369-7569
11/12/2008	IL	Chicago/Oak Park	Robert Beiter	708-445-7171
11/12/2008	MA	Marlboro	Pamela Gordon	860-526-8686
11/12/2008	OH	Dayton	Chris Pavlakos	937-436-1161
11/12/2008	OR	Portland	Rodney Atack	503-614-8465
11/12/2008	TX	Houston	Johnny Sanders	800-869-6783
11/13/2008	IA	Des Moines	Christine Pernetti	319-369-7569
11/13/2008	IL	Chicago/Oak Park	Robert Beiter	708-445-7171
11/13/2008	MA	Marlboro	Pamela Gordon	860-526-8686
11/13/2008	OR	Portland	Rodney Atack	503-614-8465
11/13/2008	TX	Houston	Johnny Sanders	800-869-6783
11/14/2008	NC	Morrisville	Thomas Cameron	919-459-5255
11/14/2008	OH	Dayton	Chris Pavlakos	937-436-1161
11/19/2008	AZ	Phoenix	John Elmore	800-357-5759
11/19/2008	IN	Ft Wayne	James Jerome	317-841-9829
11/20/2008	AZ	Phoenix	John Elmore	800-357-5759
11/20/2008	IN	Ft Wayne	James Jerome	317-841-9829
11/20/2008	PA	Pittsburgh	Roger Angelelli	412-831-0430
11/21/2008	NJ	Piscataway	Ellen Kelly	732-238-1664
11/21/2008	PA	Pittsburgh	Roger Angelelli	412-831-0430
12/2/2008	MA	Auburn	Steven Fournier	508-832-8484
12/3/2008	AL	Birmingham	Georgia Holmes	205-934-7178
12/3/2008	LA	Kenner	Michael Seidemann	504-443-5670
12/3/2008	NC	Greensboro	Cheryl Nadeau	336-547-5609
12/3/2008	NC	Morrisville	Thomas Cameron	919-459-5255
12/3/2008	OH	Cincinnati	Timothy Swisher	412-367-8690
12/3/2008	OH	Columbus	James Jerome	317-841-9829
12/3/2008	TX	Houston	John Elmore	800-357-5759
12/4/2008	AL	Birmingham	Georgia Holmes	205-934-7178
12/4/2008	OH	Cincinnati	Timothy Swisher	412-367-8690
12/4/2008	OH	Columbus	James Jerome	317-841-9829
12/4/2008	TX	Houston	John Elmore	800-357-5759
12/8/2008	FL	W Palm Beach	Herbert Greenberg	678-352-0312
12/9/2008	CT	Windsor	Pamela Gordon	860-526-8686
12/10/2008	CT	Windsor	Pamela Gordon	860-526-8686
12/10/2008	GA	Atlanta	Melette Meloy	678-363-9897
12/10/2008	IL	Chicago/Schaumburg	Thomas Thunder	847-359-1068
12/10/2008	TX	San Antonio	John Elmore	800-357-5759
12/11/2008	GA	Atlanta	Melette Meloy	678-363-9897
12/11/2008	NC	Greensboro	Cheryl Nadeau	336-834-8775
12/11/2008	TX	San Antonio	John Elmore	800-357-5759
12/15/2008	GA	Dalton	Melette Meloy	678-363-9897
12/16/2008	GA	Dalton	Melette Meloy	678-363-9897
12/17/2008	NJ	Piscataway	Ellen Kelly	732-238-1664
12/17/2008	OR	Aloha	Michael Fairchild	503-259-2685
1/19/2009	KY	Owensboro	Joseph Etienne	270-926-0418
2/4/2009	GA	Atlanta	Melette Meloy	678-363-9897
2/5/2009	GA	Atlanta	Melette Meloy	678-363-9897
2/9/2009	NE	Omaha	Thomas Norris	402-391-3982
2/11/2009	NE	Omaha	Thomas Norris	402-391-3982
3/10/2009	MA	Auburn	Steven Fournier	508-832-8484
3/18/2009	TN	Nashville	Melette Meloy	678-363-9897
3/19/2009	TN	Nashville	Melette Meloy	678-363-9887
4/8/2009	MA	Auburn	Steven Fournier	508-832-8484
4/22/2009	KY	Owensboro	Joseph Etienne	270-926-0418
4/27/2009	MN	Minneapolis	Ted Madison	612-625-2443
5/5/2009	TN	Chattanooga	Melette Meloy	678-363-9897
5/6/2009	MA	Auburn	Steven Fournier	508-832-8484
5/7/2009	TN	Chattanooga	Melette Meloy	678-363-9897
6/1/2009	NE	Omaha	Thomas Norris	402-391-3982
6/3/2009	NE	Omaha	Thomas Norris	402-391-3982
6/10/2009	SC	Columbia	Melette Meloy	678-363-9897
6/11/2009	SC	Columbia	Melette Meloy	678-363-9897
6/16/2009	MA	Auburn	Steven Fournier	508-832-8484

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