

ACOM Publishes Position Paper on Noise-Induced Hearing Loss; NHCA Responds

The American College of Occupational Medicine Noise and Hearing Conservation Committee has developed a position paper in response to requests of "What are the distinguishing features of occupational noise-induced hearing loss?". This position paper was published in the *Journal of Occupational Medicine*, in December, 1989. The National Hearing Conservation Association reviewed this document, and felt the need to respond to it in a letter to the editor of the *Journal of Occupational Medicine*. Below is printed the NHCA letter, with the ACOM statements from the position paper printed in boldface:

December 28, 1989

To the Editor:

In the December, 1989 issue of the *Journal of Occupational Medicine* (JOM), the American College of Occupational Medicine's (ACOM) Hearing Conservation Committee published a position statement on the distinguishing features of occupational noise-induced hearing loss.

The National Hearing Conservation Association (NHCA) takes issue with some of these "distinguishing features" of occupational noise-induced hearing loss, and we wish to share our views with the JOM readers. While many of the ACOM's statements are often true, there are enough exceptions to warrant serious concern about the finality with which they are made. As JOM readers are aware, human response, both physiological and psychological, is seldom characterized appropriately by "always" or "never" designations. Consequently, we believe that the ACOM's "distinguishing features" can lead to dangerous oversimplifications in the management of hearing loss cases. The most obvious danger is that an individual's hearing loss will be misdiagnosed as non-noise-related, simply because it does not fit neatly into the ACOM's set of criteria.

The NHCA is a national, non-profit professional organization whose purpose is to promote the conservation of hearing in American workers and in the general population. Our member-

ship is composed primarily of audiologists, but includes other professionals such as physicians, industrial hygienists, and nurses who are also responsible for the prevention and evaluation of noise-induced hearing loss. Our members provide hearing conservation services to more than one million American workers in industrial, military, and other settings.

In the discussion below, we will first present the ACOM's statements, printed in boldface, followed by our comments on each statement.

Definition

Occupational noise-induced hearing loss as opposed to occupational acoustic trauma is always a slowly developing hearing loss over a long period of time (several years) as the result of exposure to continuous or intermittent loud noise; whereas occupational acoustic trauma is a sudden change in hearing as a result of a single exposure to a sudden burst of sound such as an explosive blast.

The diagnosis of noise-induced hearing loss is made clinically by a physician and should include a study of the noise exposure history.

We have no objection to the distinction between occupational noise-induced hearing loss and noise-induced acoustic trauma, although the end results are usually indistinguishable on

ACOM's continued on page 4

IN THE SPRING ISSUE:

The ASHA Committee on Quality Assurance's Tutorial on the AIDS/HIV Virus

the audiogram. We do, however, object to the implication that the physician is the only professional who can diagnose noise-induced hearing loss. Audiologists are very well qualified to diagnose noise-induced hearing loss by studying a patient's history and by evaluating the hearing function audiologically, including testing for middle ear involvement. Audiologists do not diagnose medical pathologies of the ear, or recommend or perform treatment for such.

Characteristics

The principal characteristics of occupational noise-induced hearing loss are always as follows:

1. It is always sensorineural affecting the hair cells in the inner ear.

The statement is true, although acoustic trauma can, of course, affect the tympanic membrane and other middle ear structures. At this time there is no diagnostic test to assess hair cell damage in a living patient.

2. Noise induced hearing loss is almost always bilateral. Audiometric patterns are usually similar bilaterally.

Noise-induced hearing loss is usually bilateral, but large databases analyzed by our members show that up to 14% of the losses are unilateral, more than one would expect in the non-noise-exposed population. Unilateral losses can occur when one cochlea is protected by a conductive component, or from acoustic trauma, or from other causes that are more difficult to identify. Moreover, we find that the audiometric patterns in each ear are often dissimilar, especially in degree of hearing loss. This is most common among farmers and shooters, whose left ears are often considerably more affected than the right ears.

3. It never produces a profound hearing loss. Except under rare circumstances, low-frequency limits are about 40 dB and high-frequency limits about 75 dB.

Noise-induced hearing loss certainly can reach a profound state if individual frequencies are considered. Our members often encounter noise-

exposed workers who are unable to hear high frequency pure tones at the limit of the audiometer. It is not at all unusual to find workers exposed to long periods of time to the noise of heavy industry, such as foundries and metal fabrication, with hearing threshold levels in excess of 40 dB in the low frequencies and 75 dB in the higher frequencies (re ANSI, 1969).

4. Once the exposure to noise is discontinued, there is no significant further progression of hearing loss as a result of the noise exposure.

There is no evidence to the contrary, but there is insufficient scientific support for this statement. We suspect that there is no further progression, but we do not know this for a fact.

5. Previous noise-induced hearing loss does not make the ear more sensitive to future noise exposure. As the hearing threshold increases, the rate of loss decreases.

This has been a popular presumption until recently, but there is some preliminary evidence that existing noise-induced hearing loss may actually render the cochlea more susceptible. We do not yet have sufficient research results to make definitive statements about this issue.

6. The earliest damage to the inner ear reflects a loss at 3000, 4000, and 6000 Hz. There is always far more loss at 3000, 4000, and 6000 than at 500, 1000, and 2000 Hz. The greatest loss usually occurs at 4000 Hz. The higher and lower frequencies take longer to be affected than the 3000 to 6000 Hz range.

While this statement is usually true, there are certain notable exceptions. When the stimulus is a narrow band of noise or pure tone, the maximum hearing loss will occur at or about one-half octave above the frequency of the stimulus. This result can occur in the low and mid-frequencies, as well as in the high frequencies. It has been demonstrated in laboratory experiments and is characteristic of real-world exposures as well. Also, the statement that frequencies above 6000 Hz take longer to be affected is not always true, since high-frequency audiometry demonstrates that certain frequencies above the range of conventional audiometry (i.e. above 8000 Hz), are sometimes affected before those in

the conventional frequency range. With respect to 8000 Hz, the fact that the loss at this frequency may sometimes equal or exceed the loss at 4000 and 6000 Hz does not necessarily indicate an etiology other than noise exposure. The cause could be aging, noise, or a combination of noise and aging, or it could be due to faulty earphone placement, to which frequencies above 6000 Hz are notoriously sensitive.

7. Given stable exposure conditions, 3000, 4000, and 6000 Hz will usually reach an asymptote (maximum level) in about ten (10) to fifteen (15) years.

This statement is not borne out by longitudinal data available to some of our members. One study of 20 years of stable exposures shows rapid initial deteriorations of hearing threshold levels, with subsequent gradual deterioration, but not asymptote.

8. Continuous noise exposure over the years is more damaging than interrupted exposure to noise which permits the ear to have a rest period.

Noise that is truly "interrupted" or intermittent returns to negligible, or at least non-damaging levels between noise episodes. This type of noise is rare in factories, because noise from neighboring sources continue even when a worker's particular machine is not operating, and walls and other reverberant surfaces usually do not permit the noise level to decay sufficiently before periods of noise. Moreover, lunch and other breaks are often taken at the work station, or in areas that are not designed for recovery of the hearing mechanism. Therefore, while it is true that "interrupted" noise is less damaging than continuous noise, this statement rarely applies to the factory environment.

We appreciate the opportunity to comment on the ACOM's "distinguishing features", and we hope these observations will be useful to JOM readers.

Sincerely,
Carolyn Tolley
President, NHCA