without recalibrating, for a TDH-39/MX-41AR earphone in some cases, but most available data have not been reduced to a form suitable for establishing a revised estimate of the reference threshold levels. This paper reports the results of such a data analysis.

2:15

HH6. The interaction of impulse and continuous noise: Energy and spectral considerations in the production of hearing loss. Michele Roberto (Department of Bioacoustics, University of Bari, Bari, Italy), William A. Ahroon, Robert I. Davis, and Roger P. Hamernik (Auditory Research Laboratories, SUNY, Plattsburgh, NY 12901)

Realistic industrial noise environments containing impulsive and continuous noise were modeled using a 5-day exposure paradigm that produces an asymptotic threshold shift (ATS). Pre- and postexposure measures of hearing thresholds were obtained on 96 chinchillas using evoked auditory responses (EAR). Six control groups were exposed to octave bands of noise at 0.5, 2.0, and 4.0 kHz at 95, 90, and 86 dB SPL, respectively, or impacts of 113, 119, or 125 dB peak SPL presented once per 1, 4, or 16 s, respectively. Nine interaction groups were exposed to combinations of an impulse and continuous noise. The greatest spectral overlap of energy occurs between the impulse and the 0.5 kHz octave band of noise. Although each of the different impulse noise exposures were balanced to produce an equal energy exposure, an exacerbation of hearing loss was produced in animals exposed to the 119- and 125-dB impacts in combination with the low-frequency (0.5-kHz) continuous noise. This synergistic effect gradually disappears when the spectral overlap between noises is reduced. [Research supported by NIOSH.]

2:30

HH7. Temporary threshold shift after exposure to a narrow-band noise, frequency-modulated tones, continuously variable frequency tones and a pure tone. I. M. Young and L. D. Lowry (Department of Otolaryngology, Jefferson Medical College of Thomas Jefferson University, Philadelphia, PA 19107)

Temporary threshold shift after exposure to four stimulating sounds were measured by automatic audiometry for three subjects with normal hearing. Stimulating sounds were (1) a pure tone, (2) continuously variable frequency tones between 1250 and 1750 Hz, (3) frequency-modulated tones centered at 1500 Hz with a frequency deviation of $\pm$ 250 Hz and a modulation rate of 25 per s, (4) a narrow-band noise with a bandwidth of 1250–1750 Hz. Subjects were exposed to stimulating sound through an earphone at the intensity of 110 dB SPL and duration of 10 min. Temporary threshold shift was measured for frequencies between 1000 and 8000 Hz beginning at 5 s after cessation of the stimulating sound. Results indicated that the greatest shift was observed at a frequency 2000 Hz by a pure tone stimulation and the least shift by a narrow-band noise. Effects of continuously variable frequency tones and frequency-modulated tones were intermediate. These findings were compared and discussed with temporary threshold shift following exposure to white noise at equivalent intensity and duration.

2:45

HH8. Effects of brief, intense tones on auditory temporal acuity. Craig A. Champlin and Lawrence L. Feth (Department of Speech–Language–Hearing: Sciences and Disorders, University of Kansas, Lawrence, KS 66045)

A gap detection threshold (GDT) procedure was used to measure auditory temporal acuity in humans before and after exposure to a brief, intense low-(0.4-kHz) or high-(1.7-kHz) frequency tone. The maximal temporary threshold shift (TTS) produced by each exposure was approximately 10 dB. GDT stimuli were octave-band noises centered at one of three frequencies: the exposure frequency, 1/2 oct above the exposure frequency, or 1 oct above the exposure frequency. GDTs were obtained at 35, 55, and 75 dB SPL at each center frequency. GDT and TTS recovery were monitored for 16 min following an exposure. The results from the high-frequency exposure condition indicate that changes in GDT can be predicted from shifts in absolute threshold. For the low-frequency condition, differences between the GDT and TTS recovery functions and elevated GDTs in the absence of significant TTS require an alternative explanation. [Work supported by NIOSH.]

3:00

HH9. Temporal integration in normal hearing, cochlear impairment, and impairment simulated by masking. Mary Florentine, Hugo Fastl, and Søren Buus[a] (Communication Research Laboratory, 133 FR, Northeastern University, Boston, MA 02115)

To assess temporal integration in normal and impaired listeners, absolute thresholds for tones were measured as a function of duration. Durations ranged from 500 ms down to 15 ms at 0.25 kHz, 8 ms at 1 kHz, and 2 ms at 4 and 14 kHz. An adaptive 2I, 2AFC procedure with feedback was used. On each trial, two 500-ms observation intervals, marked by lights, were presented with an interstimulus interval of 250 ms. The monaural signal was presented in the temporal center of one observation interval. The results for four normal and six impaired listeners show (1) as expected, thresholds for normal listeners decrease about 8 dB per decade of duration, (2) for impaired listeners, the decrease usually is much less (2 to 6 dB) in the range of a hearing loss, but normal at frequencies where thresholds are normal, (3) for listeners with impairments simulated by masking, the slopes are nearly the same as those for normal listeners and steeper than those for the real impairments. These results indicate that the shallow slopes observed for impaired listeners probably are not due to splatter of energy to frequency regions where thresholds are low, but reflect diminished temporal integration, *per se*. [Work supported by NIH-NINCDS RO 1NS 18280.] [a] Also at Department of Electrical and Computer Engineering, Northeastern University.

3:15

HH10. Comparison between loudness functions in noise and in noise-induced hearing loss. Rhona P. Hellman (Auditory Perception Laboratory, Northeastern University, Boston, MA 02115)

Pure-tone loudness functions were generated in a cochlear-impaired population with moderate to severe noise-induced losses. Three procedures were used: magnitude estimation, magnitude production, and cross-modality matching. The slope of the loudness function was determined over the stimulus range where cochlear impairment steepens the loudness function. Both the measured and predicted slopes show that the steepening of the loudness function depends on the severity of the hearing loss; that is, the higher the threshold the steeper the function. While this behavior is also observed in partially masked normal ears, the extent of the agreement between the partially masked and impaired loudness functions is determined by the bandwidth of the masking noise. The impaired loudness functions closely agree with those obtained in wide-band noise, but not with those obtained in narrow-band noise as wide as an octave. This finding implies that the effect of the cochlear impairment on the loudness function resembles that of an external noise with a broad frequency spectrum. [Work supported by the Rehabilitation Research and Development Service of the VA.]

3:30

HH11. Loudness judgments in recruiting ears as influenced by intensity, and interspersed changes in intensity. Maureen A. Korman, Ernest M. Weiler, and Angel Dell'Aira (Communication Disorders, University of Cincinnati, Mail Location No. 379, Cincinnati, OH 45221)

It has been found that loudness judgments adapt to monaural stimulus increments [E. M. Weiler, D. E. Sandman, and L. M. Pederson, Brit. J. Audiol. **15**, 201–204 (1981)]. The present study was undertaken to determine whether the changes in high-frequency recruiting ears measured at a nonrecruiting frequency (1000 Hz), were the same as in normal listeners. Both groups showed a similar decline in judgment to the baseline 660-dB tone. There was a significant interaction between groups, intensity, pulsed

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