INTRODUCTION

National Research Agenda for the Prevention of Occupational Hearing Loss

Occupational hearing loss is the most common work-related injury in the United States. Although the estimates vary, it is thought that ~22 million U.S. workers are exposed to hazardous noise levels at work, and an additional 9 million are exposed to ototoxic chemicals, which also can lead to hearing impairment. A significant but unknown number of workers have suffered a work-related hearing loss. The problem crosses many occupational sectors, including manufacturing, construction, transportation, agriculture, and the military. Hearing loss resulting from noise or chemical exposures is permanent. It is also preventable. In addition to hearing loss, many workers suffer from noise-induced tinnitus (ringing in the ears) and face the possibility of noise-related accidents and other adverse health effects.

Most occupational hearing losses develop gradually as the result of metabolic processes due to chronic exposure, but hearing loss can also develop instantaneously from acoustic trauma, in which a single, hazardous noise mechanically damages the delicate structures of the ear. When the Occupational Safety and Health Administration (OSHA) issued its hearing conservation amendment in 1981, the agency estimated that, at that time, more than 1 million workers in the manufacturing industries had developed a material impairment of hearing. Noise is the most common hazard that leads to occupational hearing loss; but exposure to solvents, metals, asphyxiates, pesticides, heat, and other physical or chemical agents also may affect workers' hearing. Hearing damage is cumulative and often does not become apparent until substantial, irreversible injury has occurred.

The type of hearing loss caused by noise or chemical exposure is categorized as sensorineural. Vulnerable sensory cells and nerve fibers in the cochlea are slowly damaged and destroyed. Neural signals transmitted to the brain for interpretation as sound are diminished or lost. No treatment exists to reverse or repair the effects of noise or chemical exposures on the auditory system.

Hearing impairment has significant consequences for workers, both on and off the job. A diminished ability to communicate with coworkers or monitor sounds in the work environment (e.g., warning signals, equipment sounds, backup alarms) can reduce productivity and place workers at increased risk for accidents. The increased effort required for communication can cause stress and fatigue. Quality of life may be diminished as the hearing-impaired individual faces difficulty communicating with family and friends and misses such pleasures as enjoying music, hearing children's voices, and listening to sounds in nature. It is not unusual for hearing impairment to lead to social isolation and depression. In addition to the difficulties posed by loss of hearing, other adverse effects of exposure (such as tinnitus) may further increase a worker's debilitation.

[1]National Institute for Occupational Safety and Health, Cincinnati, Ohio.

Address for correspondence: Mark R. Stephenson, Ph.D., National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226 (e-mail: mos9@cdc.gov).

National Research Agenda for the Prevention of Occupational Hearing Loss; Guest Editor, Mark R. Stephenson, Ph.D.

Semin Hear 2013;34:141–142.
DOI: http://dx.doi.org/10.1055/s-0033-1349349.
ISSN 0734-0451.

In 1996, the National Institute for Occupational Safety and Health (NIOSH) established the National Occupational Research Agenda (NORA) as a framework to guide research and focus efforts to prevent work-related illness and injury. The NORA program is a partnership that seeks to involve all stakeholders in occupational safety and health, including businesses, worker organizations, professional societies, universities, and government agencies. Over 500 organizations and individuals outside NIOSH contributed to the development of the original research agenda. The NORA goal is to identify the most critical workplace hazards and work together to address them.

The original NORA program identified 21 research priorities based on the number of workers at risk, the severity of the hazard or outcome, and the probability that new research would have an impact on reducing the particular illness or injury. Occupational hearing loss was included among the original priority areas. In 2006, NORA was reorganized by industrial sectors. Because noise exposure affects so many different industries, hearing loss was retained as a NIOSH cross-sector program that addresses NORA sector priorities.

The NORA Hearing Loss Team was tasked with developing a national research agenda for the prevention of occupational hearing loss. Each team member contributed to the original draft, which continued to evolve over time. The current document represents the culmination of several years of deliberation and revision. In 2009, the document was updated and expanded to reflect progress in noise-related research over recent years.

This white paper is organized into two primary sections. The first outlines areas in which the adverse consequences of occupational noise require further definition. Research is still needed to estimate the prevalence of noise and other ototoxic exposures in the workplace, to measure progress in reducing or eliminating those exposures, to define the risk posed by various agents, and to understand the mechanisms of damage. In addition, there are unresolved questions regarding the auditory and extra-auditory effects of noise and other occupational exposures on workers, as well as the personal and professional impact of these effects on workers. The second section outlines research needed to address the problem through prevention programs. These programs have many aspects, including noise measurement and control, hearing protection, audiometric monitoring, training and motivation, record keeping, and program evaluation. Each of these areas could benefit from the development of innovative techniques to improve their effectiveness or to extend their application to underserved populations.

In developing the research agenda, the NORA Hearing Loss Team endeavored to highlight topics appropriate for both basic and applied research. Basic research involves development of better methods of understanding and preventing hearing loss in the future; applied research involves current prevention of hearing loss and other adverse effects. Both types of research are essential to reducing the burden of occupational hearing loss. However, in keeping with the NIOSH vision of "safety and health at work for all people through research and prevention," more emphasis has been placed on applied research needs that could have a more immediate impact on reducing the burden of occupational hearing loss.

Mark R. Stephenson, Ph.D.[1]
Guest Editor

SEMINARS IN

Hearing

Volume 34
Number 3
August 2013

National Research Agenda for the Prevention of Occupational Hearing Loss

Guest Editor
Mark R. Stephenson, Ph.D.

Editor in Chief
Catherine V. Palmer, Ph.D.

CONTINUING EDUCATION

AMERICAN ACADEMY OF AUDIOLOGY

www.thieme.com/sih
www.thieme-connect.com/ejournals
ISSN 0734-0451

Thieme Medical Publishers is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. **See course information for number of ASHA CEUs, instructional level and content area.** ASHA CE Provider approval does not imply endorsement of course content, specific products or clinical procedures.

Thieme
New York · Stuttgart