MedicalXpress

Vitamin supplements may protect against noise-induced hearing loss

February 17 2009

Vitamin supplements can prevent hearing loss in laboratory animals, according to two new studies, bringing investigators one step closer to the development of a pill that could stave off noise-induced and perhaps even age-related hearing loss in humans.

The findings will be reported Wednesday at the Association for Research in Otolaryngology's annual conference in Baltimore by senior author Colleen Le Prell, Ph.D., a researcher at the University of Florida.

The supplements used in the research studies are composed of antioxidants — beta carotene and vitamins C and E — and the mineral magnesium. When administered prior to exposure to loud noise, the supplements prevented both temporary and permanent hearing loss in test animals.

"What is appealing about this vitamin 'cocktail' is that previous studies in humans, including those demonstrating successful use of these supplements in protecting eye health, have shown that supplements of these particular vitamins are safe for long-term use," said Le Prell, an associate professor in the UF College of Public Health and Health Professions' department of communicative disorders.

About 26 million Americans have noise-induced hearing loss, according to the National Institute on Deafness and Other Communication Disorders, the agency that funded the studies.

In the first study, UF, University of Michigan and OtoMedicine scientists gave guinea pigs the vitamin supplements prior to a four-hour exposure to noise at 110 decibels, similar to levels reached at a loud concert. Researchers assessed the animals' hearing by measuring sound-evoked neural activity and found that the treatment successfully prevented temporary hearing loss in the animals.

In humans, temporary noise-induced hearing loss, often accompanied by ringing in the ears, typically goes away after a few hours or days as the cells in the inner ear heal. Because repeated temporary hearing loss can lead to permanent hearing loss, the scientists speculate that prevention of temporary changes may ultimately prevent permanent changes.

In the second, related study in mice, UF, Washington University in St. Louis and OtoMedicine researchers showed that the supplements prevented permanent noise-induced hearing loss that occurs after a single loud sound exposure. The researchers found that the supplements prevented cell loss in an inner ear structure called the lateral wall, which is linked to age-related hearing loss, leading the scientists to believe these micronutrients may protect the ear against age-related changes in hearing.

"I am very encouraged by these results that we may be able to find a way to diminish permanent threshold shift with noise exposure," said Debara Tucci, M.D., an associate professor of surgery in the otolaryngology division at Duke University Medical Center. "I look forward to hearing Dr. Le Prell's work and reviewing her data."

The research builds on previous studies that demonstrated hearing loss is not just caused by intense vibrations produced by loud noises that tear the delicate structures of the inner ear, as once thought, said Josef Miller, Ph.D., who has studied the mechanisms of hearing impairment for more than 20 years and is a frequent collaborator of Le Prell's.

Researchers now know noise-induced hearing loss is largely caused by the production of free radicals, which destroy healthy inner ear cells.

"The free radicals literally punch holes in the membrane of the cells," said Miller, the Townsend professor of communicative disorders at the University of Michigan.

Miller is the co-founder of OtoMedicine, a University of Michigan spinoff company that has patented AuraQuell, the vitamin supplement formula used in the studies.

The antioxidant vitamins prevent hearing damage by "scavenging" the free radicals. Magnesium, which is not a traditional antioxidant, is added to the supplement mix to preserve blood flow to the inner ear and aid in healing.

Antioxidant supplements can also provide "post-noise rescue," Le Prell said. A previous study by Le Prell and Miller showed that antioxidants can protect hearing days after exposure to loud noise.

"We found that the antioxidant combination of vitamin E and salicylate — the active agent in aspirin —effectively prevented cell death and permanent noise-induced hearing loss even when treatments were delayed up to three days after noise insult," she said.

The researchers are collaborating on National Institutes of Health-funded clinical trials of the vitamin supplements in college students at UF who wear MP3 music players, and noise-exposed military troops and factory workers in Sweden and Spain.

If the trials show that the vitamins are as effective in preventing noise-induced hearing loss in humans as they have been in animals, Le Prell and Miller envision an easy-to-use supplement that could come in the

form of a pill for people headed to a rock concert, a daily supplement for factory workers or a nutritional bar included in soldiers' rations.

"Ear protection, such as ear plugs, is always the best practice for the prevention of noise-induced hearing loss, but in those populations who don't or can't wear hearing protection, for people in which mechanical devices just aren't enough, and for people who may experience unexpected noise insult, these supplements could provide an opportunity for additional protection," Le Prell said.

Source: University of Florida