

Can you hear me now? Stem cells enhance hearing recovery

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Tokyo, Japan -- Researchers have shown that bone marrow stem cells injected into a damaged inner ear can speed hearing recovery after partial hearing loss. The related report by Kamiya et al, "Mesenchymal stem cell transplantation accelerates hearing recovery through the repair of injured cochlear fibrocytes," appears in the July issue of *The American Journal of Pathology*.

Hearing loss has many causes, including genetics, aging, and infection, and may be complete or partial. Such loss may involve damage to inner ear cells called cochlear fibrocytes, which are fundamental to inner ear function. Some natural regeneration of these cells can occur after acute damage, leading to partial recovery of temporary hearing loss. But could such restoration be enhanced by using bone marrow stem cells, which can differentiate into various tissue-specific cell types"

Dr. Tatsuo Matsunaga of National Tokyo Medical Center pursued this hypothesis by utilizing a well-characterized rat model of drug-induced hearing loss. This model specifically destroys cochlear fibrocytes and leads to acute hearing loss. Although partial recovery occurs over many weeks, high-frequency hearing remains extremely diminished. Using this system, the investigators examined whether direct administration of stem cells into the inner ear could restore the cochlear fibrocyte population and aid hearing recovery.

Stem cells injected into the inner ear survived in half of the injured rats, where they migrated away from the site of injection toward the injured

region within the inner ear. These stem cells divided in the new environment and expressed several proteins necessary for hearing, suggesting tissue-specific differentiation. Further, transplanted cells that migrated to the damaged area of the inner ear displayed shape similar to that of cochlear fibrocytes.

Importantly, transplanted rats exhibited faster recovery from hearing loss, particularly in the high frequency range, which is difficult to restore by natural regeneration. Stem cell migration into the damaged area of the inner ear improved hearing of high frequency sound (40 kHz) by 23% compared to natural recovery in untreated animals.

This is the first report to demonstrate hearing recovery following stem cell transplantation into the inner ear. “Cell therapy targeting regeneration of the cochlear fibrocytes may therefore be a powerful strategy to cure sensorineural hearing loss that cannot be reversed by current therapies,” state Dr. Matsunaga and colleagues.

Source: American Journal of Pathology

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