

Micropump for Hearing-Loss Treatments

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Hearing aids have existed for hundreds of years. Wearable, electrical hearing aids have been around for 75 years. In the past 50 years cochlear implants have been used to create or restore hearing for some of the estimated 30 million people in modern societies affected by permanent hearing loss and deafness. Most cases of hearing loss occur in people 65 years or older.

The older technologies currently used produce similar outcomes: they amplify and filter sound to enhance hearing. These technologies work by altering the sound coming into the ear rather than actually improving the hearing abilities of the patient.

Researchers at Rochester Institute of Technology aim to develop a micropump for administering drugs and gene-based therapy treatments. The goal of this project: improved treatment and curing of auditory dysfunction through inner ear analysis.

"Pioneering studies in the areas of auditory gene therapy and chemotherapy have produced exciting results showing potential for protection and regeneration of sensory systems in the inner ear," explains David Borkholder, the project's principal investigator and professor of electrical engineering at RIT.

"More elaborate treatments are needed to achieve full restoration of hearing in animal models and for translational results in human clinical trials." (*)

The project team aims to develop an implantable, refillable, variable-flow micropump platform for intracochlear drug delivery for deafness therapy research. Initially, a device will be designed for and tested using mice. This micropump will enable chronic, calibrated delivery of multiple therapeutic agents that is not possible with existing pump technologies. The project is expected to provide a detailed understanding of acceptable dose and timing profiles for intracochlear drug delivery in mice without detriment to cochlear function. The technology is scaleable to use in humans and may be particularly useful in pediatrics.

Although *some* people are helped with hearing aids, the majority of those with hearing loss or hearing-related balance disorders go untreated. Future biomedical interventions will aim to treat underlying biological problems that cause permanent hearing loss, rather than trying to amplify and filter incoming sounds. The micropumps are needed for research aimed at repairing or restoring nerve cells in the inner ear. Long-term goals include developing and testing inner ear micropumps for clinical applications to treat human inner-ear hearing and balance problems.

Sources:

- (*) Saffran, Michael. "Micropump' for hearing-loss Treatments." Medicalnews. 16 Feb 2007. Rochester Institute of Technology. <http://www.medicalnewstoday.com/medicalnews.phpnewsid=62932>
- Wikipedia
- <http://www.nidcd.nih.gov/health/hearing/hearingaid.asp>

