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OKC institute discovers promising process to regrow hair cells critical to reversing hearing loss



BY JIM STAFFORD
For The Oklahoman

For the 300 million people worldwide who live with disabling hearing loss, few alternatives exist to restore their critical sense of hearing. Hearing aids. Cochlear implants. And little else.

Both alternatives are too expensive for most of the world's population to afford.

"Hearing aids cost about \$5,000 every five years, and cochlear implants cost at least \$50,000," said Dr. Richard Kopke, an ear surgeon and CEO of Oklahoma City's Hough Ear Institute. "And 90 percent of those 300 million people cannot even afford a hearing aid."

Hough Ear Institute has pioneered a promising new alternative to restore hearing loss for those living with the condition. The not-for-profit research institute discovered a way to regrow the sensory hair cells in the inner ear that are critical for hearing.

Hough Ear Institute was established in the early 1980s by the Baptist Medical Center Foundation to continue the work of Dr. Jack Hough, an internationally respected otologist. In 1997, the institute became a free-standing research institution and today shares space with the Otologic Medical Clinic.

Hough Ear Institute employs 10 scientists and four support staff, all of whom are focused on advancing technologies to restore hearing.

Most hearing loss is attributed to two main factors, Kopke said.

"Noise and birthdays," he said. "Age-related causes and loud noise account for two-thirds of all sensorineural hearing loss. Once the noise kills the hair cells or, in the aging process, once the hair cells are lost, they don't come back. It's a permanent deficit."

Hough Ear Institute recently published a paper about its hair cell regenerating technology in the peer-reviewed scientific journal "Molecular Ther-



Hough Ear Institute has pioneered a promising new alternative to restore hearing to those living with hearing loss. [PHOTO PROVIDED BY OCAST]



Richard Kopke, M.D.

apeutics," published by the American Society of Gene and Cell Therapy.

Hough Ear's strategy to regrow hair cells involves a technique that blocks a protein that keeps the cochlear tissues from regenerating hair cells. The article lists 10 Hough Ear Institute researchers — including Kopke — as co-authors.

Publication of the discovery is important for a number of reasons, said Matthew West, Ph.D., a Hough Ear Institute research scientist and one of the authors.

"It shows other researchers how they might envision strategies to complement or implement our technologies in a clinical setting or even in their own studies," West said. "Also, a very important benefit of (publication) is that it validates our approach."

There are more ongoing developments by the institute.

Hough Ear and its commercialization partner, Otologic Pharmaceuticals Inc., recently were awarded a \$1.9 million Department of Defense grant to support the hair cell regeneration research. Their application was the only one among 73 submissions that was awarded funding.

Kopke and Oklahoma Medical Research Foundation scientist Robert Floyd, Ph.D., are Otologic Phar-



MORE ONLINE

To watch a video about the Oklahoma City institute that has discovered a process that could provide hope to millions suffering from hearing loss, go online to Oklahoman.com.

maceutics co-founders. The company has received local investment from i2E Inc., the Presbyterian Health Foundation, Accele BioPharma and local "angel" investors among others.

Otologic Pharmaceuticals has the exclusive license to the hair cell regeneration technology as well as the license for another later stage therapy, NHPN-1010.

"We saw enormous worldwide impact for these potential therapeutics" says Dr. Elaine Hamm, chief operating officer of Otologic Pharmaceuticals. "To work with the great scientists at Hough Ear Institute and on such disruptive innovation ... and being able to do so at a small startup in the heart of Oklahoma City, is so rewarding. These drugs have the potential to be truly transformative for so many people."

Otologic Pharmaceuticals successfully completed a Phase 1 clinical trial for NHPN-1010 to treat acute noise-induced hearing loss and tinnitus, which is the perception of noise, such as a ringing or buzzing sensation, in the absence of a true noise stimulus. The condition afflicts millions of people.

"What we've discovered unexpectedly is that it regrows some key nerve endings in the cochlea by itself," Kopke said. "This pill actually regrows the nerve endings and reforms the synapses. So you can potentially take a pill and have a lot of your hearing

restored and reduce tinnitus. That was unexpected." Hough Ear Institute's research has been supported by numerous grants from the Oklahoma Center for the Advancement of Science and Technology (OCAST). Those grants have led to even more funding and ultimately to the groundbreaking results.

"We've had a lot of success with those OCAST grants," Kopke said. "Those grants have kept us going, and we have leveraged them for much larger grants from outside the state and also developed the intellectual property that is needed to move it forward. They've been a huge help to us."

The ability to regrow hair cells and restore hearing is a truly groundbreaking discovery, said Hough Ear Institute scientist Dr. Xiaoping Du, also a co-author of the recently published paper.

"Our results with hair cell and hearing recovery were very robust and reproducible," he said.

Added Kopke: "It's something that most people in our field over the years said wouldn't be possible. Being able to regrow cochlear hair cells could be a breakthrough treatment that could help the 300 million around the world have restored hearing."

Jim Stafford writes about Oklahoma innovation and research and development topics on behalf of the Oklahoma Center for the Advancement of Science & Technology.