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Stem cell transplants explored at Stanford as a possible treatment for hearing loss

SAN FRANCISCO -- Stefan Heller's dream is to someday find a cure for deafness.

As a leader in stem cell-based research on the inner ear at the Stanford University School of Medicine, he's got a step-by-step plan for making this dream a reality.

It may take another decade or so, but if anyone can do it, he's the guy to place your bets on.

"Everyone asks, 'How long before we do this?'" said Heller, PhD, associate professor of otolaryngology, whose accent still bears the trace of his native Germany. "I tell them the devil is in the details."

But even at the national level, those in the research community remain hopeful that Heller's work will reap successes sooner rather than later. Heller will discuss his stem cell research during a panel discussion Feb. 17 in San Francisco at the annual meeting of the American Association for the Advancement of Science. The session is titled "Hearing health: The looming crisis and what can be done about it."

James Battey, MD, director of the National Institute on Deafness and Other Communication Disorders, lauded Heller as "one of the leading auditory neuroscientists" and points to his stem cell regeneration research as a high priority for the institute.

Heller's vision is to develop a variety of possible cures for deafness. For the past year and a half, since coming to Stanford from Harvard, he's been focused on two paths: drug therapy -which could be as simple as an application of ear drops - and stem cell transplantation into the inner ear to remedy hearing loss.

Currently he's working on perfecting the steps toward eventual stem cell transplantation into humans, with the goal of first curing deafness in mice within the next five years. His lab is also busy studying the ability of birds to regenerate the tiny hair cells in the cochlea. It's these cells

that convert the mechanical energy of sound into electrical impulses that are sent to the brain so that a chicken, a mouse or a human can hear. Chickens, like all birds, have the ability to spontaneously regenerate these hair cells, which explains why there are no deaf birds.

"This is promising because it means the genetic program for regeneration exists somewhere in the vertebrate family," Heller said. "We know there is an unknown signal to regenerate that we could use, but we first have to find it."

The idea of using drug therapy to cure deafness has been at the back of Heller's mind since he began researching the inner ear 12 years ago, and it has become more plausible as a result of his lab's successes in the field of stem cell research during the past seven years.

Heller gained international attention in 2003 for identifying stem cells that reside within the inner ear. Since then, his research has focused on using these stem cells to regenerate the critically needed hair cells in the inner ear. Later in 2003, his group reached another significant milestone: the team demonstrated that it is possible to coax embryonic stem cells in a test tube to differentiate into hair cells - and then also to have the stem cells differentiate after transplantation in the ears of chicken embryos.

The two different approaches - new drugs and stem cell transplants - are important because drug treatments are unlikely to help everyone. For some people with genetically caused hearing disorders, he explained, no drug is likely to help. "For them, stem cell transplantation may be the answer," he said

But for the majority of those with hearing loss, particularly in the aging population, drug therapy could be the solution. As the population has aged and noise pollution has grown more severe, health experts now estimate that one in three adults over the age of 65 has developed a handicapping hearing loss.

Coming up with the answers is a slow process, Heller said. "This research takes time and money, but we remain hopeful we'll have some principle answers soon."

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EMBARGOED FOR RELEASE UNTIL: Saturday, Feb. 17, 2007, at 9:45 a.m. Pacific time to coincide with a presentation at the American Association for the Advancement of Science's annual meeting. Heller will also speak at a press briefing later that day at 1 p.m. MEDIA CONTACT: Tracie White at (650) 723-7628 (traciew@stanford.edu)

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