Stem Cell Research Blog

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Stem Cells May Lead to Develop New Therapeutic Approaches to Hearing Loss

In addition to loud noise, certain cancer drugs or genetic factors can cause hearing loss in humans due to loss or faulty development of the sensory 'microphones' (hair cells) inside the ear – the cochlea.

Lost hair cells are not replaced and people exposed to these conditions face permanent hearing loss. Identification of the stem cells from the adult cochlea would be a major step forward to develop new therapeutic approaches to hearing loss.

Members of the National Center for Regenerative Medicine research team, Dr. Robert Miller and Dr. Kumar Alagramam, both of Case Western Reserve University School of Medicine, recently published research findings in Developmental Neuroscience which suggest new ways of treating hearing loss.

These researchers have isolated "cochlear stem cells" located in the inner ear and already primed for development into ear-related tissue due to their proximity to the ear and expression of certain genes necessary for the development of hearing.

The team's research is a major step in devising a therapy to reverse permanent hearing loss because it may lead to the activation of cochlear stem cells in the inner ear to regenerate new hair cells.

In this paper, Drs. Miller and Alagramam offer further evidence of the formation of spheres from early postnatal cochlear tissues and their expression of a wide range of developmental markers unique to hair cells confirm the possibility that self-supporting hair cell precursors exist in or can be derived from the postnatal mammalian cochlea.

Currently there are no clinical treatments to repair these hair cells vital to normal hearing. In the United States, 30% of people over the age of 65 have a handicapping hearing loss and of those, one in 500 people become deaf before reaching adulthood.

In most cases, the target is the highly specialized hair cells. Docked inside the spiral duct of the human cochlea are ~15,000 hair cells, which are highly specialized neuroepithelial cells that enable us to hear a violin or a whisper. These hair cells differ in length by minuscule amounts and are set in motion by specific frequencies of sound. We hear this sound because this motion induces the hair cell to release an

electrical impulse which passes along the auditory nerve to the brain. If the sound is too loud, the hair cells are damaged and no longer send signals to the brain. Severely damaged hair cells do not repair themselves nor do they regenerate naturally.

While further research is necessary, the researchers believe these precursor cells have the potential to regenerate the damaged hair cells and restore normal hearing.

Source: Case Western Reserve University

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- Duchenne Muscular Dystrophy (12)
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Archives:

- April 2007 (5)
- March 2007 (17)
- February 2007 (22)
- January 2007 (25)
- December 2006 (3)
- November 2006 (20)
- October 2006 (32)
- September 2006 (32)
- August 2006 (36)
- July 2006 (34)
- June 2006 (19)
- May 2006 (15)
- April 2006 (25)
- March 2006 (29)
- February 2006 (6)
- January 2006 (11)
- December 2005 (11)
- November 2005 (26)
- October 2005 (18)
- September 2005 (16)
- August 2005 (26)
- July 2005 (41)
- May 2005 (4)
- April 2005 (8)
- March 2005 (5)
- February 2005 (4)
- December 2003 (1)
