

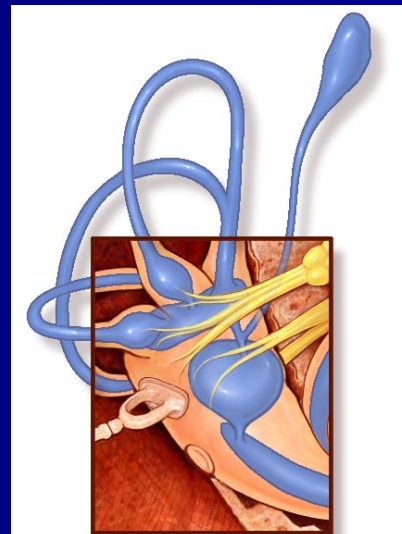
Recent and Eagerly Anticipated Advances in Hearing Disorders

**American Hearing Research
Foundation gala -- 2006**

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Professor, Northwestern

Recent advances

- Meniere's disease
 - Uncommon disorder (1/2000)
 - Hearing loss, tinnitus, and vertigo
 - Chronic disease



Hydrops

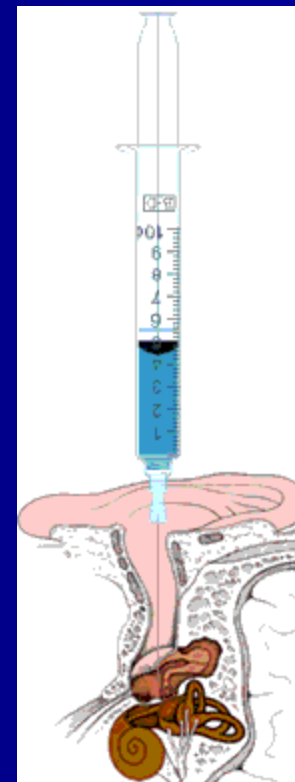
Meniere's disease

Old treatment paradigm

- Salt restriction and/or diuretic
- Vestibular suppressants for dizziness
- Destroy inner ear for severe cases
 - Often results in deafness

New treatment

- Low dose Gentamicin
- Injection into ear
- 80% effective
- No side effects



Low-dose gentamicin is a remarkable advance

- Better quality of life for Meniere's sufferer's
- Less or no medication
- No damage to ear from treatment itself

Present and near future: Bionic ears

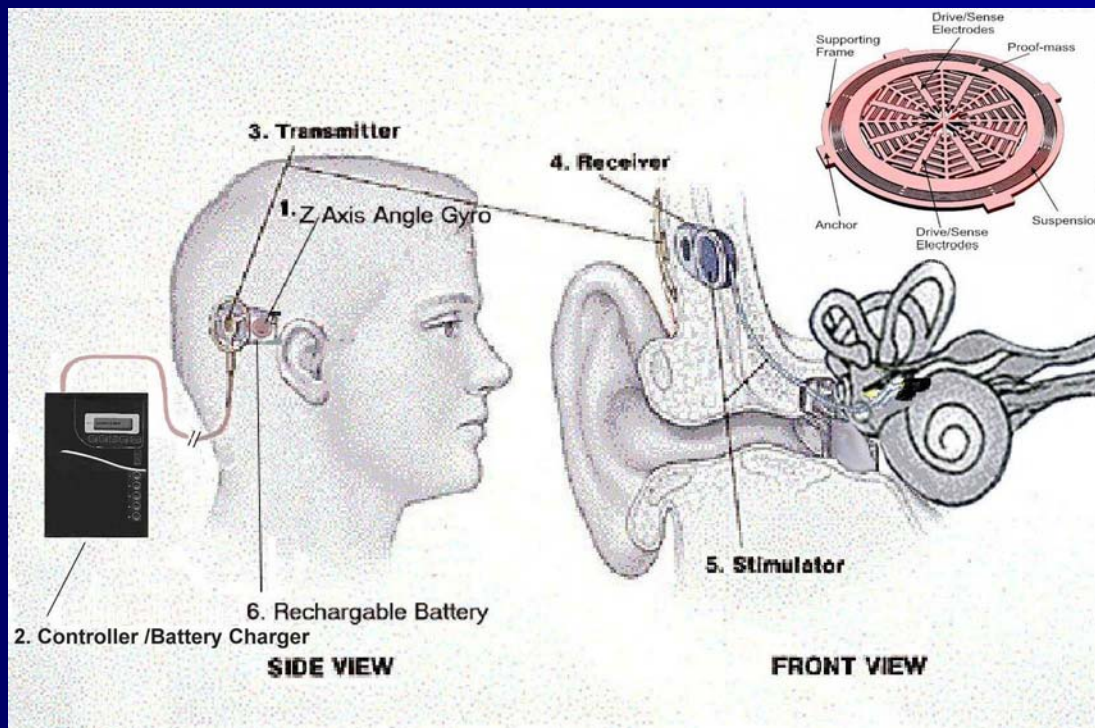
- Cochlear implant – for bilateral deafness
- Remarkable advance
- Restores hearing



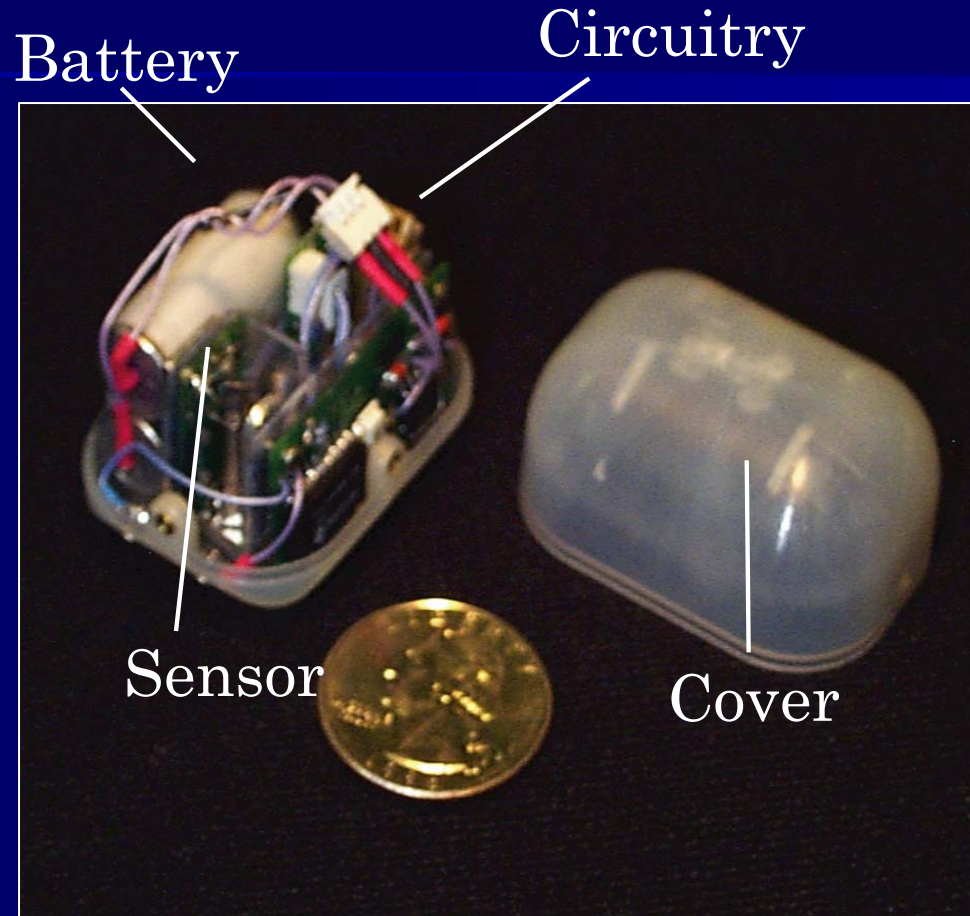
Bilateral vestibular loss can be equally disabling



Vestibular implant – for bilateral vestibular loss



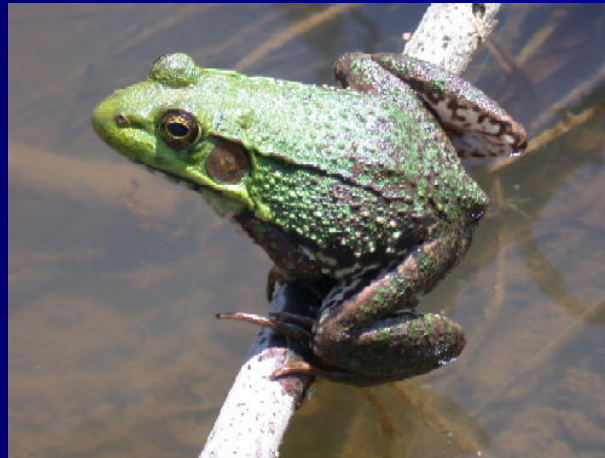
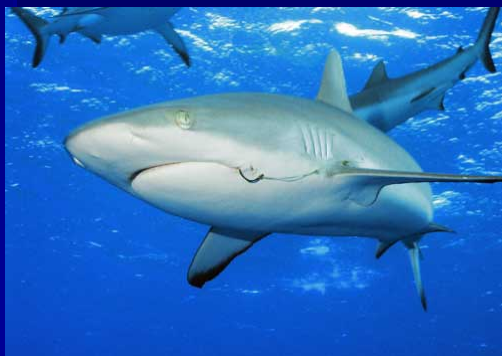
Prosthetic Semicircular Canal Being developed at Mass Eye/Ear



Source: Rick Lewis, MEEI

10 years – Hair cell regeneration

- Since 1970's, known that Sharks, Frogs and Birds can re-grow their hair cells in inner ear



10 years – Hair cell regeneration



- Experiment: Give a bird a drug that kills inner ear
- Result: deaf bird
- Wait 4 months
- Result: bird hears again

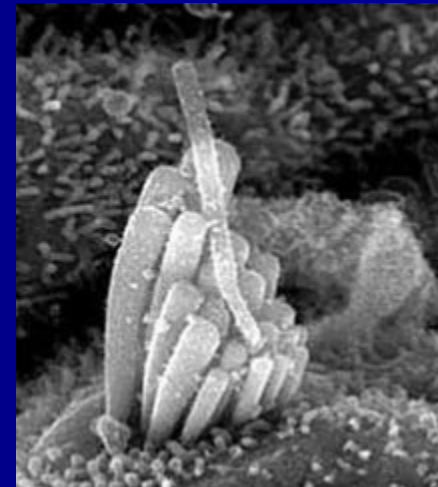
Birds and People are not that different



It should be possible to turn on the same gene that Birds/Sharks/Frogs use in people, and regenerate the inner ear

Early research (2003)

- Hair cells regenerated in Guinea pigs
- By injection of a gene (math1) into the inner ear, scientists coaxed the ears of normal adult guinea pigs to sprout new hair cells.



K. Kawamoto et al.
Neurosci. 2003 Jun
1;23(11):4395-400.

Regeneration in deaf mammals (guinea pigs), 2005

- The same group improved hearing in deaf animals using similar method
- Demonstration of cellular and functional repair in the ear of a mature deaf mammal.

– Izumikawa M, Minoda R, Kawamoto K, Abrashkin KA, Swiderski DL, Dolan DE, Brough DE, Raphael Y. Auditory hair cell replacement and hearing improvement by Atoh1 gene therapy in deaf mammals. Nat Med. 2005 Mar;11(3):249-50.

Hair Cell Regeneration

- Huge potential benefit !
 - Eliminate need for most hearing aids
 - No need for cochlear implant
 - Eliminate one class of dizziness by regrowing inner ear

The Future Looks Promising for Hearing !

- Better treatments
 - Technical advances
 - Regeneration
-
- Support Hearing Research !

