

STANFORD

# CENTER FOCUS

A PUBLICATION FOR THE FRIENDS OF STANFORD UNIVERSITY MEDICAL CENTER • SUMMER 2006



## Clinical Trials Advance New Treatments

- Emergency Medicine
- Secrets of Stem Cells
- Cancer Therapies



# Bioscience + Technology

STANFORD'S DEPARTMENT OF OTOLARYNGOLOGY IS  
COLLABORATING ON NEW WAYS TO RESTORE HEARING

**S**tanford's Department of Otolaryngology-Head & Neck Surgery is at the cutting edge of research to restore hearing, treat and prevent cancer of the head and neck, and develop technology that will unite the human ear and voice with digital technologies.

In three years since coming to Stanford, Robert Jackler, MD, a professor of otolaryngology and the Edward C. and Amy H. Sewall Professor, has created a world-class research, teaching, and clinical enterprise focusing on regenerative medicine and bioengineering that will have

a significant impact on the lives of people afflicted with head and neck disorders.

Housed in a superbly renovated campus building—and with a 7,000-square-foot state-of-the-art laboratory under construction—the ENT department now includes 15 faculty members and more postdoctoral clinical fellowship programs than any other program in the United States. Its research teams are collaborating with departments across the university, such as molecular and cellular physiology, neurobiology, bioengineering, computer science, and

mechanical engineering, to create treatments and technologies that will change how people communicate.

For example, Dr. Jackler predicts that we will soon be wearing ear devices as a computer interface, cell phone, Web access, digital audio player, GPS receiver, and possibly even an instantaneous language translation mechanism. Such devices offer the promise of improving the sense of hearing in general and overcoming hearing loss. Through the Stanford Center for Advanced Human Communication, researchers are developing these futuristic hearing devices to hang off the ear but expect they may eventually become implantable.

Cochlear implants are being refined that include multi-channel wires that stimulate the auditory nerve in the inner ear directly. Department researchers are also identifying drugs that may protect people from the dizziness and permanent hearing loss that can result from some chemotherapies.

To improve microsurgery of the inner ear, teams of bioengineers and otolaryngologists are developing a tiny lighted system to provide illumination and magnification of these minute and fragile structures. Another promising project explores high-speed imaging of the human voice to detect vocal disorders automatically.

The department is also involved in improving cancer treatment by working with leading stem cell researchers to identify stem cells in head and neck cancer—cells that survive to reestablish disease after surgery and chemotherapy. Isolating such cells may lead to new strategies that eradicate cancer at its core, according to Dr. Jackler.

“We’ve got an incredibly talented group,” Dr. Jackler says. “They are engaged in a broad, ambitious, and exciting research program that will improve head and neck health and that may eventually revolutionize the way we speak, hear, and interact with the natural and man-made world.” ❖

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### Inducing Stem Cells to Improve Hearing

The slow creep of hearing loss can start as the tiny hair cells in the inner ear responsible for detecting sound succumb to environmental stresses like chronic noise, overdoses of antibiotics, and certain chemotherapy drugs. It's these cells that convert the mechanical energy of sound into electrical impulses that are sent to the brain so that we can hear. Hair cells do not regenerate and, with only 15,000 of them in each cochlea, it's no wonder that progressive hearing loss is so common.

But Stefan Heller, PhD, an associate professor of otolaryngology and of molecular and cellular physiology, may be onto a cure for cochlear hair cell loss. He has discovered that stem cells—cells that can be induced to divide into many kinds of tissue—also reside in the human ear. With the right chemical stimulation, stem cells can

become hair cells. Dr. Heller and his team are hard at work trying to find a drug that will reliably accomplish the job.

Dr. Heller gained international attention for having first identified stem cells that reside within the inner ear in 2002, when he was a faculty member at Harvard. Since then, his research has focused on using these stem cells to regenerate critically needed hair cells in the inner ear.

“Using a drug will be a much simpler way of stimulating hair cell growth than implantation, which would require donor matching and microsurgical techniques that have not yet been developed,” Dr. Heller says. His team has already coaxed both mouse and human adult stem cells to divide into hair cells, and Dr. Heller predicts that his group may see significant results within the next five years.