

Hearing Restoration Project

The 21st Century is “The Age of Communication” – the ability to hear is essential to progress in education, productive employment, and enhanced quality of life

Objective:

The Deafness Research Foundation (DRF) seeks funding of \$10 million per year over five years, to finance the Hearing Restoration Project (HRP) through a consortium of senior scientists at major labs who will accelerate progress in regenerative biology of the inner ear with the goal of developing a biologic cure for severe hearing loss. The DRF will provide administrative management of the HRP.

The Deafness Research Foundation (DRF):

Since 1958, the DRF has been the leading source of private funding for basic and clinical research in hearing and balance science in the U.S.: research which made possible the development of the cochlear implant, refinement of digital and implantable hearing aids, treatments for otitis media, breakthroughs in the regeneration of inner-ear hair cells and the study of genetic deafness. George A. Gates, M.D., who serves as the DRF Medical/Scientific Director, is a pre-eminent physician/scientist who, as Director of The University of Washington's Virginia Merrill Bloedel Hearing Research Center from 1993-2004, led an interdisciplinary group of scientists to the forefront of research into hearing, hearing loss, and related communication disorders. The DRF now wishes to expand that effort nationally.

The Problem:

- Approximately 30 million Americans have hearing loss sufficient to cause them difficulty communicating. As baby boomers age, this number is expected to increase exponentially.ⁱ
- Fully 68.6% of deployed military has Noise Induced Hearing Loss, Tinnitus, and other hearing injuries, compared to 4% of those who have never been deployed.ⁱⁱ

The Economic Costs:

The economic costs of hearing loss to the United States alone are staggering:

- The combined cost of communication disorders to the U.S. economy is between \$157 and \$189 billion per year, which is 2.5-3% of the predicted 1999 GNP for the U.S.ⁱⁱⁱ
- Among Veterans, “Impairment of Auditory Acuity” and “Tinnitus” are ranked the first and second service-connected compensable disabilities in FY 2006. This is a 56.0% increase by FY 2002-2006.^{iv}

Current Treatments:

Currently, there is no cure for the underlying cause of hearing loss: damage to the sensory and supporting cells of the inner ear, whether from noise exposure, trauma, chemical toxins, medications, aging, disease, or genetic disorders. Prevention of hearing loss is mainly limited to protection (e.g., ear plugs), and treatment is based on increased stimulation of the remaining sensory cells (hearing aids) or by stimulating the hearing nerve directly (cochlear implants).

Regeneration Biology – Finally a Cure for Hearing Loss is Possible:

Discoveries over the last 15 years have provided a scientific basis for finding a biologic cure for severe hearing loss. We now know that birds regenerate their inner ear cells spontaneously after noise damage. Small mammals can be induced to regenerate the missing cells partially in the laboratory. Many of the genes and molecules that regulate these processes have been identified, but scientists have only just started to understand how to control them. These avenues of discovery are worth vigorous pursuit – both as an economic savings and to improve the quality of life for millions of Americans, including veterans, with hearing loss.

A New Approach is Needed:

Using today's scientific methods and current levels of research funding, it is estimated that it will take fifty years for a breakthrough in regeneration biology of the inner ear. Current research funding, most of which comes from the NIH, is based on peer review of detailed proposals originating from an individual scientist's initiative or in response to program announcements from the funding agency. Because collaboration is discouraged under current funding systems, laboratories vying for limited financial resources are not inclined to combine forces or to propose innovative research projects. Modern biomedical research is rapidly changing and highly specialized, so that teams of investigators from many areas of expertise are required to solve complex problems. Unfortunately, there are currently no provisions to fund teams of scientists from different laboratories with different expertise to work collaboratively and efficiently to solve the highly complex problems of hearing loss.

The Consortium Model is That New Approach:

The **Hearing Research Consortium (Consortium)** is a team of internationally recognized senior scientists who have agreed to lead and design a coordinated, integrated approach to answer key research questions and, indeed, have done so in several pilot studies. The consortium model depends upon the active involvement of all participants in setting goals, determining objectives, and assessing results – all in a transparent process. A preliminary meeting was held in April 2007 and participants and member labs produced a Blue Ribbon Panel Report, which will serve as a road map for the Consortium. All qualified researchers demonstrating genuine commitment to the goals of the Consortium are eligible to participate. Explicit milestones and deliverables will be set by group leaders. Each must be met by participating laboratories in order for them to continue as a Consortium member. Reviews are regular and ongoing, with biannual assessments to determine success and future funding. Research results and advances will be made available to the entire research community.

Resources Needed:

The DRF seeks funding of \$10 million per year over five years [total \$50 million], to support 5-10 labs directed by America's best and brightest hearing scientists at \$1-2 million each year. DRF will provide management of the HRP through its oversight committee chaired by the DRF Medical/Scientific Director, George A. Gates, M.D.

Expected Results:

1. Acceleration of the research in regeneration biology of the inner ear in the crucial areas of tool building, database creation, and replication of results.
2. Research breakthroughs that will lead to a cure for severe hearing loss.
3. Measurable economic savings to the DoD, the VA in particular, and the nation.
4. Creation of a collaborative research model, the consortium model, which will be a road map for future research science in all areas, saving untold millions of dollars and years of suffering.

HRP Investigators and Institutions (to date):

Edwin Rubel, Ph.D. -- Jenny Stone, Ph.D.,
University of Washington
Neil Segil, Ph.D. -- Andrew Groves, Ph.D.,
House Ear Institute, Los Angeles
Mark Warchol, Ph.D.,
Washington University -- St. Louis
Douglas Cotanche, Ph.D., Children's Hospital,
Boston

Albert S. Edge, Ph.D., Harvard University
Yehoash Raphael, Ph.D., University of Michigan
Stefan Heller, Ph.D., Stanford University
Dianne Durham, Ph.D. -- Hinrich Staecker, M.D.,
Ph.D., University of Kansas
Jeffrey Corwin, Ph.D., University of Virginia
James Saunders, Ph.D., University of Pennsylvania

i NIDCD

ii Thomas M. Helfer *et al* (2005). Post Deployment Hearing Loss in U.S. Army Soldiers Seen at Audiology Clinics From April 1, 2003, through March 31, 2004. *American Journal of Audiology Vol. 14, December 2005*. p164.

iii Robert Ruben, MD, FACS, FAAP (2000) Redefining the Survival of the Fittest: Communication Disorders in the 21st Century. *Laryngoscope 110: February 2000*. p 245 [updated with current statistics]

iv Veterans Benefit Affairs Annual Benefits Report FY 2006, p 27 and 18.

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