



### **Yehoash Raphael, Ph.D.**

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## **New Therapies to Cure Deafness and Balance Disorders**

Dr. Yehoash Raphael is Director of the Otopathology Laboratory at the University of Michigan's Kresge Hearing Research Institute in the Department Otolaryngology, Head & Neck Surgery. Dr. Raphael received his bachelor's degree from Tel Aviv University in Israel in Audiology and Communication Disorders. His graduate work was done at Tel Aviv University and the Weizmann Institute, where he studied developmental biology. His Ph.D. thesis was on cell adhesion molecules and cytoskeletal differentiation in the inner ear. During his studies, Dr. Raphael received several grants that allowed him to expand his knowledge and expertise by working in several leading labs in the field of Hearing Research, in Japan (Kyoto Univ.), Sweden (Karolinska Institutet), and the USA (Albert Einstein College of Med., NYC).

Dr. Raphael served in the Israel Defense Forces on active duty from 1971 to 1974 and in the reserves from 1974 to 1988, and participated in front line active duty during the Yom Kippur War (1973), Litani Campaign (1978) Peace for the Galilee War (1982) and other operations.

Dr. Raphael came to Ann Arbor as a postdoctoral fellow and was mentored by Dr. Richard Altschuler at the Kresge Hearing Research Institute. He joined the faculty at U-M in 1991.

Dr. Raphael's research has been focused on understanding diseases involving loss of hearing and balance, with the general goals being protection, repair and regeneration. By studying the mechanism of hearing loss due to over-stimulation (loud noise), medication side effects, aging or hereditary inner ear disease, Dr. Raphael paves the way for novel therapies that would confer protection against these disease or repair ears that are already damaged. Dr. Raphael has pioneered the use of gene therapy for hearing and restoration in deaf ears. He has also expanded his activities to future treatment for loss of balance, in collaboration with Dr. Michael King at U-M. Work on hereditary inner ear disease involves collaborations with several groups in Michigan and around the world, with the major emphasis being a cure for the most common hereditary deafness, GJB2. Dr. Raphael is also involved in work to improve the function of the cochlear implant prosthesis, currently the only therapy available for profoundly deaf persons. For this purpose, Dr. Raphael has pioneered a novel method for inducing regeneration of nerve cells into the deaf ear. In collaboration with Dr. Bryan Pflugst at U-M, the physiological improvements caused by this regeneration are now being investigated. The ability to induce nerve regeneration also serves to prepare the tissue for stem cell implantation. Dr. Raphael's group has been able to advance the procedure for placing new cells to replace missing sensory cells in the ear.

Dr. Raphael is guided by important clinical goals for inner ear treatments. To that end, the lab is active in advancing technology for delivering genes and small molecules to cells of the living inner ear. In addition, Dr. Raphael has been working closely with several pharmaceutical companies, developing novel drugs or technologies related to the ear. Among these companies are Amgen, GenVec, Alcon, Pfizer and several small companies with novel technologies or products. With these strong connections to the pharmaceutical companies, Dr. Raphael expects to advance research on restoration of hearing and balance into a new era, providing treatment of inner ear disease for millions of individuals in this country and elsewhere.

Dr. Raphael provides research experience for a large number of students at all levels, from undergrads to fully qualified ear doctors who spend time in the lab learning the basics of lab work. The lab is open to people from around the world, but priority is given to students from U-M and elsewhere in Michigan. This summer two students from Lawrence Technological University in Southfield will join the team, to experience the research environment and possibly embark on a project.

The lab has been funded by NIH grants since the early 1990s, with further support by companies and philanthropy. Funding from the the A. Alfred Taubman Medical Research Institute has been extremely helpful in developing the novel approaches for regeneration of neurons and placement of stem cells in deaf ears, using methods that are typically too innovative to qualify for NIH funding.

Dr. Raphael's innovative approaches for curing inner ear disease and his pioneering accomplishments in this field have made him an international leader in inner ear research. He received several awards in recognition of his scientific contributions, including an award from the National Hearing Conservation Association, the Bellucci Award for a major contribution in the area of auditory research, the Deafness Research Foundation Research Award, a "Top 50" Award by Scientific American in 2005, and a prestigious membership in the Collegium Oto-Rhino-Laryngologicum. Dr. Raphael serves on numerous national and international committees, review boards and organizations, including several NIH Study Section panels.