

Project Title: A novel therapeutic strategy of mitochondrial transplantation into inner ear for the treatment of hearing loss

Principal Investigator: Hamid Djalilian, MD

Noise-induced hearing loss (NIHL) is one of the most common types of hearing loss and its prevalence has been rising due to exposure to harmful recreational noise. Unfortunately, there is no current treatment for NIHL, highlighting the urgent need for new therapeutic approaches. NIHL primarily derives from degenerative changes in the cochlea, the auditory portion of the ear. Cochlear cells are metabolically active and therefore rely on healthy mitochondria to fulfill their energy need. However, excessive noise exposure causes increased consumption of a large amount of energy, eventually leading to mitochondrial dysfunction. Indeed, mitochondrial dysfunction has been highly associated with many causes of NIHL and thus targeted for NIHL treatment. A very recent approach of mitochondrial therapy (mitotherapy) utilizing transplantation of non-native healthy mitochondria into damaged organs has shown promising results in treating mitochondria-related diseases. However, this novel strategy has never been tested for the treatment of hearing loss. More importantly, its feasibility or safety for inner ear injection is yet not known. Key investigators of our team have already joined the forefront of mitotherapy. Given the groundbreaking progress of mitotherapy for the treatment of other diseases, our study proposes to determine the feasibility and safety of mitochondrial transplantation into the inner ear. The successful outcome of these pilot studies will be used in the future to tailor mitotherapy approach as a strategy for the treatment of NIHL as well as other hearing disorders.