Pathophysiology of Neurotrauma

Neonatal Murine Cochlear Explant Technique as an In Vitro Screening Tool in Hearing Research

Sensorineural Hearing Loss (SNHL) is a condition that typically involves damage to or loss of the delicate mechanosensory structures of the inner ear. Promising pharmaceutical treatments for hearing loss are often tested on homogenous cell cultures in vitro, but such systems do not accurately model the cochlear microenvironment.

Researchers at the Massachusetts Eye and Ear Infirmary, (Boston, Massachusetts) have characterized a cochlear explant model to study the cochlea ex vivo while preserving vital cross-talk between the vastly different cell types that coexist within the cochlea. They have published a detailed protocol by which to generate, maintain, and evaluate treated cochlear explants, and discussed specific application including use in the screening of potentially therapeutic compounds and the comparative evaluation of viral vectors for gene therapy (*Landegger, Dilwali, and Stankovic 2017*). An ex vivo explant approach allows researchers to visualize the effects of a given treatment on different cell populations in situ, facilitating the identification of cell type-specific mechanisms and the subsequent refinement of targeted therapeutics (Figure 1).

The development and characterization of an in vitro cochlear explant model will aid the identification of mechanisms that contribute to SNHL and screening of promising compounds for hearing restoration.

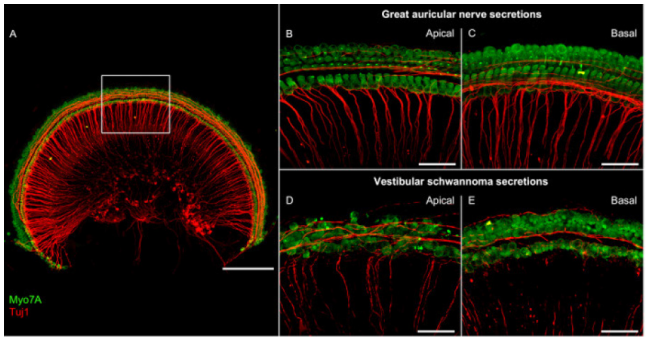

FIGURE 1: Representative Confocal Microscopy Images of Cochlear Explants from the Apical and Basal Regions after Incubation with Secretions from Great Auricular Nerves or Vestibular Schwannomas for 48 h. (A) Overview image of an explant. The rectangle marks the area in close-up images. Scale bar = 200 µm. (B-E) Zoomed-in views of hair cells and neurites. Scale bar = 50 µm. Green = Myosin 7A (Myo7A), stains hair cells; red = class III beta-tubulin (Tuj1), stains neuronal structures. (Figure used with permission from the authors)

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REFERENCES:

Landegger, L. D., Dilwali, S., and Stankovic, K. M. 2017. "Neonatal Murine Cochlear Explant Technique as an in Vitro Screening Tool in Hearing Research." J Vis Exp (124). doi: 10.3791/55704.