OFFICIAL ABSTRACT and CERTIFICATION

The Effect of Cell-Cell Communication on the Polarization of the Lateral Line of Zebrafish

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The most common form of deafness (sensorineural hearing loss) is the result of the inability of the human inner ear to regenerate hair cells after damage. Hair cells are responsible for transforming mechanical stimuli into neural impulses through a process known as mechanotransduction. Since zebrafish maintain their ability to regenerate these cells throughout their lives, the zebrafish lateral line is used as a model system for the investigation of hair cell development. Pairs of hair cells attain opposite polarities during development by communicating through a Notch-Delta signaling pathway soon after division from a common progenitor. To study this process, nascent hair cells were ablated while undergoing this signaling process. The study aimed to identify the duration of these signaling events as well as characterize the effect of missing a signaling partner. A posterior bias was observed in the surviving sister cells of pairs that were ablated within an hour after division occurred. This further supports the understanding of how hair bundle polarity in the neuromast is coordinated through Notch-Delta signaling. This research provides insight regarding the cells responsible for hearing impairment and has considerable implications for individuals who seek to reverse profound hearing loss.

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