Assessing the Efficacy of Pentachloropseudilin as an Inhibitor of Slow Adaptation in Hair Cells

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The fast adaptation of auditory hair cells is a well preserved process in mammals that rapidly adjusts the sensitivity of the auditory receptors to stimulus. Although diversely implicated in healthy hearing, the study of fast adaptation is severely limited by an inability to isolate its operation from slow adaptation. This research posits that pentachloropseudilin (PCIP) is a novel means of eliminating the confounding factor of slow adaptation in the investigation of fast adaptation. This research employed a microphonic preparation in which hair cells of the bullfrog (Rana catesbeiana) sacculus were mechanically stimulated by a rigid glass probe operated by a piezoelectric actuator. The microphonic response of hair cells was acquired by recording receptor potentials via electrodes in the experimental chamber. In order to assess the effect of PCIP on hair cells, time constants of fast and slow adaptation were compared between the microphonic response of sacculi exposed to an experimental PCIP solution and control saline condition. Data indicated that time constants of slow adaptation were decreased by PCIP vs. saline while peak response - stimulus curves demonstrated that exposure to PCIP lessened the sensitivity of hair cells to the stimulus. Overall, results suggest that PCIP acts as an effective control for slow adaptation by non-competitive inhibition of myosin-1c. This research was the first to identify a method of neutralizing slow adaptation for the study of fast adaptation and offers novel insight into how sound is encoded and interpreted, which may improve future hearing loss therapies.

Awards Won:

American Physiological Society: Third Award of $500