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Epithelial oscillations enhance signal detection in a peripheral sensory system ALEXANDER NEIMAN, Ohio University, TATIANA ENGEL, Yale University School of Medicine, DAVID RUSSELL, BRIAN HELBIG, Ohio University, LUTZ SCHIMANSKY-GEIER, Humboldt University at Berlin — Rhythmic spontaneous activity was observed in various peripheral sensory systems. Many sensory receptors have a specific structure where detector cells in a sensory epithelium excite primary afferent neurons. We explore how stochastic oscillations of epithelial cells affect the ability of peripheral receptors to detect weak stimuli. We use a simple analytically tractable model to contrast signal detection in two situations: (i) when epithelial oscillations are coherent, and (ii) when the coherence of epithelial oscillations is destroyed. We show that coherent epithelial oscillations decrease the variability of neuronal firing and thus to enhance discriminability of weak signals. Model predictions are supported by the analysis of experimental data from the electroreceptors of paddlefish.

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