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Experimental modeling of fluid homeostasis in the mammalian hearing organ[1] RUY IBANEZ, MOHAMMAD SHOKRIAN, JONG-HOON NAM, DOUGLAS H. KELLEY, University of Rochester — The mammalian hearing organ (cochlea) contains a long microfluidic channel (channel width $\approx 50\ \mu m$ and aspect ratio ≈ 700. Ex-vivo observations have shown that auditory stimulations induce deformations, in the form of a travelling wave, on the walls of the microfluidic channel and produce a flow. By determining the relevant physical parameters in the channel and applying scaling laws, we designed an apparatus that can replicate the physical conditions of the inner ear channel. We seek to characterize the induced flow using particle tracking velocimetry measurements, as well as characterizing the Lagrangian dynamics using a particle advection code. We validate the experimental measurements by comparing to previous analytic results. We study the effect of channels end boundary conditions (open or closed) and the shape of the wall deformation on the flow dynamics. We also find good agreement with finite-element simulations.

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