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Titre de la thèse :

Ear on chip for physiological and mechanical control of mammalian cochlear hair cells

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Hearing relies on the hair cells of the inner ear to transduce mechanical vibrations evoked by sound into electrical signals. At the level of a single hair cell, mechanoelectrical transduction results from the deflection of the hair bundle—a tuft of a few tens stereocilia that protrude from the apical surface of each hair cell into the surrounding fluid. Past evidence suggests that the mechanical properties of hair bundles—which condition the ear's sensitivity—strongly depend on their complex local ionic environment. In the case of the mammalian hearing organ—the cochlea, reproducing such environment ex-vivo remains an experimental challenge, resulting in a long-standing limitation for the study of haircell mechanosensitivity under physiological conditions. In this PhD project, we aim at developing a ear-on-chip to provide unprecedented control over key chemical parameters of the hair cells environment, while enabling mechanical stimulation of single hair bundles to characterize their mechanosensitivity. A combination of innovative microfluidic tools with numerical simulations will shed light on the physiological and physical parameters that control the mechanosensitivity of the hair bundle.

Mots clés : Organ on chip , hear cell, ionic environment, control

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