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Flow Induced by *Ex-Vivo* Nasal Cilia: Developing an Index of Dyskinesis JAMES GROTBERG, University of Michigan, MATHIEU BOTTIER, MARTA PENA-FERNANDEZ, SYLVAIN BLANCHON, GABRIEL PELLE, EMILIE BEQUIGNON, DANIEL ISABEY, ANDRE COSTE, Equipe 13, Inserm U955, Universite Paris-Est, Creteil, France, ESTELLE ESCUDIER, Inserm U933, Universite Pierre et Marie Curie, Paris, France, JEAN-FRANCOIS PAPON, Equipe 13, Inserm U955, Universite Paris-Est, Creteil, France, MARCEL FILOCHE, Ecole Polytechnique, CNRS, Universite Paris Saclay, Palaiseau, France, BRUNO LOUIS, Equipe 13, Inserm U955, Universite Paris-Est, Creteil, France — Mucociliary clearance is one of the major lines of defense of the respiratory system. The mucus layer coating the pulmonary airways is moved along and out of the lung by the activity of motile cilia, thus expelling the particles trapped in it. Here we compare *ex vivo* measurements of a Newtonian flow induced by cilia beating (using micro-beads as tracers) and a mathematical model of this fluid flow. Samples of nasal epithelial cells placed in water are recorded by high-speed video-microscopy and ciliary beat pattern is inferred. Automatic tracking of micro-beads, used as markers of the flow generated by cilia motion, enables us also to assess the steady velocity profile as a function of the distance above the cilia. This profile is shown to be essentially parabolic. This compares well to a 2D mathematical model for ciliary fluid propulsion using an envelope model. From the model and the experimental measurements, the shear stress exerted by the cilia is deduced. Finally, this shear stress is proposed as a new index for characterizing the efficiency of ciliary beating and diagnosing dyskinesis.

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