Abstract Submitted
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Spatial organization of cilia tufts governs airways mucus transport: Application to severe asthma[1] MUSTAPHA KAMEL KHELLOUFI, Aix Marseille University, DELPHINE GRAS, Med Bio Med, PASCAL CHANEZ, Aix Marseille University, ANNIE VIALLAT, CNRS — We study the coupling between both density and spatial repartition of beating cilia tufts, and the coordinated transport of mucus in an *in-vitro* epithelial model. We use a fully differentiated model epithelium in air liquid interface (ALI) obtained from endo-bronchial biopsies from healthy subjects and patients with asthma. The asthma phenotype is known to persist in the model. Mucus transport is characterized by the trajectories and velocities of microscopic beads incorporated in the mucus layer. When the beating cilia tufts density is higher than d_c =11/100x100 μm^2 a spherical spiral coordinated mucus transport is observed over the whole ALI chamber (radius=6mm). Below d_c, local mucus coordinated transport is observed on small circular domains on the epithelium surface. We reveal that the radii of these domains scale with the beating cilia tufts density with a power 3.7. Surprisingly, this power law is independent on cilia beat frequency, concentration and rheological properties of mucus for healthy subject and patient with asthma. The rotating or linear mucus transport is related to dispersion of the cilia tufts on the epithelium surface. We show that impaired mucus transport observed in severe asthma model epithelia is due to a drastic lack and dysfunction of cilia tufts.

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