

## **THE EFFECT OF CILIA COORDINATION AND MUCUS RHEOLOGY ON CLEARANCE IN THE RESPIRATORY TRACT**

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Throughout the respiratory tract, from the trachea to the terminal bronchioles, the epithelial surface of the airways is covered by cilia. While microscopic in scale, cilia produce a net motion of airway surface mucus which continuously evacuates the detrimental detritus trapped within it: pathogens and other contaminants. Effective transport rests on the proper meshing of beat frequency and coordination and the complex rheology of mucus. Composed of several glyco-protein polymers of various weights, the physical properties of mucus are highly dependent on its chemistry which can be affected by disease and medication. There is experimental evidence to suggest an optimal coupling of beat frequency and the rheological properties of mucus. However, mathematical models that fully explore how this coupling plays out as other parameters of the ciliary mat are adjusted have not been developed (such as density, liveliness, coordination, and lubrication). Using experimentally gathered physical properties and qualitative observations from literature, a mathematical model is being developed to explore the effect of those parameters on mucus clearance.