
From swimmers to the lung: Understanding the link between cilia ultrastructure and ciliary beat patterns

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Abstract

Motile cilia are ubiquitous in the animal kingdom and actuate fluids for many transport functions. Externally ciliated organisms, such as many single-celled organisms and marine larvae, often use motile cilia for locomotion and to create currents for feeding and sensing. In internally ciliated organisms, such as many mammals, including humans, motile cilia usually pump fluids, for example to clear mucus from the airways. While locomotion and pumping require different cellular and tissue architectures, the ultrastructure of individual cilia is highly conserved between animals. This fact enables us to study the link between ciliary defects and resulting locomotory phenotypes in externally ciliated organisms, where they are more easily observed and manipulated, and translate our insights of such structure-function relationships to human health relevant and less accessible systems, such as the airways. Here, I will discuss our current work in modeling how variations in molecular motor distribution affect ciliary beat patterns and how this might lead to improving our understanding and diagnosis of genetic airway diseases.

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