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Muhammad Tayeh

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Ciliary Mechanosensation in MDCK cells

College of Sciences and Health Professions

Student Researcher: Muhammad Tayeh

Faculty Advisor: Andrew Resnick

Abstract

Cilia are microscopic structures that extend from the surface of mammalian cells. Cilia can be categorized into two groups, primary cilia (non-motile) and motile cilia. Cilia are composed of tubulin subunits (microtubules) and covered by a plasma membrane. The physiological role of motile cilia has been very well documented, but the function of primary cilia remains largely unknown. It has been shown that primary cilia allow cells to sense and respond to mechanical stimuli. The ability for a cell to respond to mechanical stimuli is crucial for maintaining processes such as homeostasis. It has also been shown that defects in cilia can be matched up with different diseased states. Primary cilia have shown to regulate the release of intercellular calcium in response to fluid flow. There is a correlation between the disruption of primary cilium function and the formation polycystic kidney disease. To understand and measure the mechanical properties of primary cilia optical tweezers will be used. Calcium imaging technique will also be used to show the Ca^{+2} status of the cell. The goal of this work involved the use of the cell line MDCK (Madin-Darby canine kidney) to uncover the mechanical properties of primary cilia.