Developing an artificial membrane system to study actin-based cell motility

Project Overview

Cell movement is essential for a wide variety of biological processes and plays a central role in the development of an embryo, in the immune system and in cancer metastasis. Cell movement involves the coordinated action of numerous molecular building blocks that self-organize into a moving cell. We are trying to uncover the principles underlying this remarkable self-organization. The development of simplified artificial model systems detached from the complexity of the living cell is extremely valuable for gaining insight into the fundamental properties of this complex process. Specifically the cell movement involves the polymerization of a protein called actin which forms filaments that push the cell membrane forward. The purpose of this project will be to develop an artificial membrane system between two reservoirs, so that the contents of both reservoirs can be changed freely to allow control of the reaction dynamics. The actin machinery needed to generate protrusion will be put in one of the reservoirs. Electrical measurements will be used to identify the formation of a single membrane bilayer. Advanced optical imaging will be used to follow the dynamics of the system in real time.

The goal of this project is to develop a novel type of artificial membrane system for studying actin dynamics in which the dynamics can be followed by optical microscopy and the composition of the medium from both sides of the membrane can be controlled. The project will involve extensive wet lab work with lipids and protein, high resolution optical microscopy and electrical measurements.

Requirements

High motivation and good lab skills.
Experience with sensitive electrical measurements.
Enthusiasm to do "wet" biology experiments.

Duration: 1 semester **(**with an option to extend to 2 semesters)

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