

Research projects available in the Daniel group 2015

Each of the available 4 projects are envisioned as independent student projects (not team-based, but will involve interactions with other graduate students and collaborators of the Daniel Lab). Contact Prof. Daniel directly at sd386@cornell.edu. Please provide a resume and statement of interest.

Interaction of alpha-synuclein with model cell membranes

Alpha-synuclein is a protein involved in the transport of vesicle cargo to cells. It is also believed to play a role in Parkinson's disease. However there are still many unknowns about how this protein facilitates vesicle fusion and interacts with cell membranes in general. Our working model of alpha-synuclein function predicts that the protein is capable of bridging between synaptic vesicles and the plasma membrane. This model of alpha-synuclein function rests on direct observations of various structural states of the protein (free state, broken-helix state, extended-helix state, and partly helical states) and inter-conversions between them observed by our collaborator, David Eliezer at Weill Medical School. To effectively test this model in vitro requires an assay of synuclein's ability to influence vesicle docking and/or fusion of vesicles with membranes. In this project the influence of salt on the interaction between proteins and charged lipids will be examined, as will direct observation of labeled proteins co-localized with labeled membrane vesicles using fluorescence microscopy. Thus protein labeling strategies and quantification approaches will need to be developed as part of this project. A longer term vision for this project is to carry out fusion experiments to better understand the role alpha-synuclein plays in this process. This project will be a collaboration with a current student in the lab and Professor Eliezer at Weill.