Topic: Investigating Liposome Flux Assay systems in the context of the NavAb channel

Name: Tingwei Adeck

Mentor: Wang Shizhen, Ph.D.

Liposome flux assays (LFAs) provide a robust, affordable, and high throughput tool for the study of membrane channels. Our project entailed adapting an LFA system from (Su et al., 2016) used in the study of Potassium (K) channels. Our project conceptualized an LFA system centered around Voltage gated sodium channels (NaVs), specifically the NavAb channel. NaVs are physiologically important in the generation of action potentials within systems that require excitability for function and pathologically linked to conditions like epilepsy, migraines etc. We reasoned that developing and testing an LFA system in the context of NavAb if successful will provide a good tool for screening molecules capable of NavAb interactions (therapeutic or pathological scenarios). Interestingly, NavAb can conduct Na^+ and H^+ ions amongst others but the project we completed focused on proton (H^+) conductivity of the channel.

We developed liposomes with NavAb insertions and under specific conditions, we were able to detect proton (H^+) conductivity through the channel driven by the K^+ or Cs^+ Nernst potentials. We utilized the fluorophore (ACMA) within the liposome as our proton flux signal indicator in all experimental conditions. We confirmed that NavAb can conduct protons (H^+), the NavAb LFA system worked, and we found that increasing concentrations of ACMA (2-5 uM) within the acceptable range (0.2uM to 20uM) had no effect on proton quenching. An aberrant observation we made was that very high concentrations of ACMA (20uM) generated noise that was useful in determining noise-signal boundaries. We thought it was fascinating to find a system that could be understood or interpreted using noise as well as signal.