**Probing Structural and Dynamic Properties of Membrane Protein Using EPR Spectroscopy**

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Membrane proteins are essential in controlling bioenergetics, functional activity, and triggring signal pathways in various biological systems. In spite of their biological significance, limited structural information is currently available due to challenges in applying biophysical techniques for studying these protein systems. Electron paramagnetic resonance (EPR) spectroscopy is a rapidly growing powerful biophysical technique to study structural and dynamic properties of membrane proteins. We are applying several structural biology techniques of EPR spectroscopy such as EPR spectral lineshape analysis, power saturation EPR, and double electron electron resonance (DEER) to investigate structural properties of complex biological systems KCNE3 in various membrane environments including lipodisq nanoparticles. KCNE3 is an integral membrane protein that modulates the function and trafficking of several voltage gated potassium channels, including KCNQ1. The CW-EPR spectral measurements indicate an increase in spectral line broadening with the addition of the styrene–maleic acid (SMA) polymer to liposomes which approaches close to the rigid limit providing a homogeneous stabilization of the protein–lipid complex. Similarly, EPR DEER measurements provide a superior quality of distance measurement with an increase in the phase memory time (*T*m) values upon incorporation of the sample into lipodisq nanoparticles when compared to liposomes. These results are consistent with the solution NMR structural studies on the KCNE3.