Membrane Protein Research

The research in our lab focuses on the use of Biophysical techniques (EPR and NMR) and Molecular Dynamics modeling to study membrane associated proteins. Membrane proteins are very important for living beings for functional communication within the body components and with the surrounding environment.

Electron Paramagnetic Resonance Spectroscopy in combination with Site-directed spin labeling and molecular dynamics simulation can reveal the hidden information about the structural Dynamics and functional behavior of membrane proteins including nanoscale level of resolution.

We use several EPR techniques such as CW-EPR Spectral Lineshape Analysis, CW EPR Power saturation, DEER and Computational Molecular Dynamics modeling techniques for the investigation of the structure and functional-dynamics of complicated membrane protein systems such as potassium channel assossary protein KCNE3 in different membrane environments such as micelles, bicelles, vesicles, and lipodisq nanoparticles. KCNE3 is a single transmembrane modulates the function and trafficking of several voltage

Molecular Biology techniques are used to prepare membrane protein samples for the EPR experiments.

Research Publications:
4. Daniel L Drew Jr, Brandon Butcher, Indra D Sahu, Tanbir Ahammad, Gunjan Dixit, Gary A Lorigan, Active S2168 and inactive S21IRS pinholin interact differently with the lipid bilayer: A 31P and 2H solid state NMR study, 2020, 1862, 183257


15. Soumili Chatterjee, Rajan Vyas, Sreevatsa Chalamalasetti, Indra D. Sahu, Jérôme Clatot, Gary A. Lorigan, Isabelle Deschênes, Sudha Chakrapani, Structural Dynamics of Slow-Inactivation in a Voltage-Gated Sodium Channel, Journal of General Physiology, 150, 1333-1347, 2018

16. Lauren Bottorf, Indra D. Sahu, Robert M. McCarrick, and Gary A. Lorigan, Probing the Local α-helical Secondary Structure of 13C-Labeled Membrane Proteins with Electron Spin Echo Envelope Modulation (ESEEM) Spectroscopy, BBA Biomembranes, 1860, 1447-1451, 2018


24. Indra D. Sahu, Daniel J. Mayo, Nidhi Subbaraman, Johnson J. Inbaraj, Robert M. McCarrick, and Gary A. Lorigan, Probing Topology and Dynamics of Integral Membrane M2δ Peptide using Magnetically Aligned Lipid Bilayers (Bicelles) and EPR Spectroscopy, Chemistry and Physics of Lipids, 206, 9-15, 2017


31. Andrew F. Craig, Emily E. Clark, Indra D. Sahu, Rongfu Zhang, Nick D. Frantz, M. Sameer Al-Abdul-Wahid, Carole Dabney-Smith, Dominik Konkolewicz and Gary A. Lorigan, Tuning the size of styrene-maleic acid copolymer-lipid nanoparticles (SMALPs) using RAFT polymerization for studying membrane proteins, *Biochimica et Biophysica Acta*, 1858, 2931-2939, 2016


34. Sangwoo S. Kim, Mary Alice Upshur, Kei Saotome, Indra D. Sahu, Robert M. McCarrick, Jim B. Feix, Gary A. Lorigan, and Kathleen P. Howard, Cholesterol dependent conformational exchange of the C-terminal domain of the influenza A M2 protein, *Biochemistry*, 54, 7157-7167, 2015


46. Indra D. Sahu, Robert M. McCarrick, Kaylee R. Troxel, Rongfu Zhang, Hubbell J. Smith, Megan M. Dunagan, Max S. Swartz, Prashant V. Rajan, Brett Kroncke, Charles R. Sanders, Gary A. Lorigan, DEER EPR Measurements for Membrane Protein Structures via Bi-functional Spin Label and Lipodisq Nanoparticles, Biochemistry, 52 (38), 6627–6632, 2013. (Number 18 position in the list of most read paper in the Biochemistry, September 2013)

47. Indra D. Sahu, Robert M. McCarrick, Gary A. Lorigan, Use of Electron Paramagnetic Resonance to solve Biochemical Problems, Biochemistry, 2013, 52 (35), 5967–5984. (Number 1 position in the list of most read paper in the Biochemistry, September 2013)


