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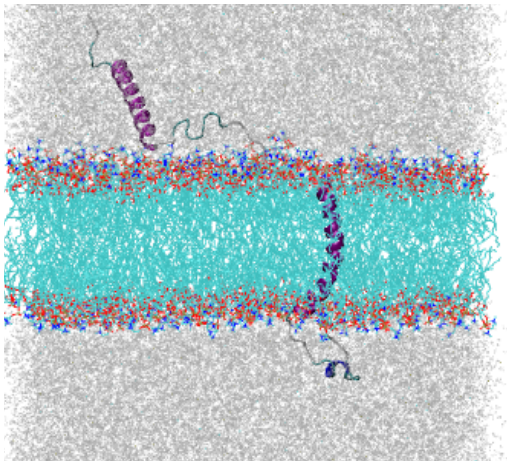
Please email me if you are interested in research collaboration.

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.



Topology of KCNE3 in POPC/POPG lipid bilayers.

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 odulates the function and trafficking of several voltage ng KCNQ1.

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

Research Publications:

1. Tanbir Ahammad, Daniel L. Drew, Rasal H. Khan, Indra D. Sahu, Emily Faul, Tianyan Li, and Gary A. Lorigan, **Structural Dynamics and Topology of the Inactive Form of S^{21} Holin in a Lipid Bilayer Using Continuous-Wave Electron Paramagnetic Resonance Spectroscopy, *J. Phys. Chem. B*** 2020, 124, 5370–5379
2. Indra D Sahu, Gunjan Dixit, Warren D Reynolds, Ryan Kaplevatsky, Benjamin D Harding, Colleen K Jaycox, Robert M McCarrick, Gary A Lorigan, **Characterization of Human KCNQ1 Voltage Sensing Domain (VSD) in Lipodisq Nanaoparticles for EPR Spectroscopic Studies of Membrane Proteins, *J. Phys. Chem. B*** 2020, 124, 2331-2342
3. Indra D. Sahu, Gary A. Lorigan, **Electron Paramagnetic Resonance as a Tool for Studying Membrane Proteins**, ***Biomolecules*** 2020, 10, 763
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
5. Kevin M Burridge, Benjamin D Harding, Indra D Sahu, Madison M Kearns, Rebecca B Stowe, Madison T Dolan, Richard E Edelmann, Carole Dabney-Smith, Richard C Page, Dominik Konkolewicz, Gary A Lorigan, **Simple Derivatization of RAFT-Synthesized Styrene–Maleic Anhydride Copolymers for Lipid Disk Formulations**, 2020, 24, 1274-1284
6. Tanbir Ahammad, Daniel L Drew, Indra Dev Sahu, Rachel A Serafin, Katherine R Clowes, Gary A Lorigan, **CW-EPR Spectroscopy Reveals the Structural Topology and Dynamic Properties of Active Pinholin S^{21}68 in a Lipid Bilayer,** 2019, 123, 8048-80560
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8. Benjamin D. Harding, Gunjan Dixit, Kevin M. Burridge, **Indra D. Sahu**, Carole Dabney-Smith, Richard E. Edelmann, Dominik Konkolewicz, and Gary A. Lorigan, **Characterizing the structure of styrene-maleic acid copolymer-lipid nanoparticles (SMALPs) using RAFT polymerization for membrane protein spectroscopic studies, *Chemistry of Physics and Lipids, 218*, 65-72, 2019**
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10. Daniel L Drew Jr, Tanbir Ahammad, Rachel A Serafin, Brandon J Butcher, Katherine R Clowes, Zachary Drake, **Indra D Sahu**, Robert M McCarrick, Gary A Lorigan Solid phase synthesis and spectroscopic characterization of the active and inactive forms of bacteriophage S21 pinholin protein, **Analytical Biochemistry**, *567*, 14-20, **2019**
11. Indra D. Sahu and Gary A. Lorigan, **EPR Techniques, Spin Labeling and Spin Trapping, Encyclodeia of Analytical Sciences, 2018,** DOI: 10.1016/B978-0-12-409547-2.14080-6
12. Andrew F. Craig, **Indra D. Sahu**, Carole Dabney-Smith, Dominik Konkolewicz, Gary A. Lorigan, **Styrene-Maleic Acid Copolymers: A New Tool for Membrane Biophysics, A Book Chapter, Chemistry and Physics of Lipids, January 2019,** 10.1515/9783110544657

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