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Nanoscale lipid models to study membrane proteins

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Developments in the field of X-ray diffraction, such as XFEL (X-ray Free Electron Laser) has become advantageous in studying Membrane Protein's structure and dynamics. For in-vitro studies, membrane protein needs to be reconstituted in a more native like hydrophobic environment. A novel membrane model system, Nanodisc due to its defined size and low mass-ratio of lipid to protein, proves to be a suitable candidate for XFEL studies. Nanodiscs are nano-sized lipid bilayer patches held intact with the help of a scaffold protein, MSP (Membrane Scaffold Protein). Engineering this protein will help in creating higher order structures, such as disulphide linked oligomers of Nanodiscs in the case of cysteine mutagenesis. This approach of engineering the protein to create well-ordered oligomeric structures will help in avoiding the normal crystallisation process.

Another recent development in the area of membrane model system is the DEBs (DNA Encircled Lipid Bilayer), where the MSP scaffold in Nanodisc is replaced by alkylated DNA, the alkylation provides enough hydrophobicity to accommodate a lipid patch. DNA being a versatile tool for nanotechnological application, DEB system with further development and characterization will help in enhancing the studies in Membrane protein.

Primary author(s) : SUBRAMANIAN, Madhumalar

Co-author(s) : IRIC, Katarina (Helmholtz-Zentrum Dresden-Rossendorf); FAHMY, Karim (Helmholtz-Zentrum Dresden-Rossendorf); SCHMIDT, Thorsten (Technical University Dresden); OERTEL, Jana (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter(s) : SUBRAMANIAN, Madhumalar

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