Qiu-Xing Jiang, J Proteomics Bioinform 2016, 9:10(Suppl)
http://dx.doi.org/10.4172/0974-276X.C1.088

6th International Conference on
Structural Biology
August 22-23, 2016 New Orleans, USA

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ChemiC: Chemically functionalized nanometer-thick carbon films for cryo-EM studies of biological complexes

With recent successful development of maximum-likelihood based refinement algorithms, direct electron detectors and motion correction, phase plates, energy filters and automatic data collection and particle selection, preparation of good cryo-EM specimens and reliable analysis of conformational and/or compositional heterogeneity in the images of single molecular complexes are becoming the rate-limiting steps in cryo-EM studies of biological specimens. ChemiC was developed in my laboratory to facilitate selective enrichment of nanogram amounts of biological complexes to the surfaces of chemically functionalized carbon-films, which, compared to the conventional, physically-treated carbon films, has multiple advantages. It allows affinity-based selection without introducing a significant amount of biomass, retains all attached molecules in a thin layer of vitrified ice that is less than 40 nm thick and has much less ice-scattering noise than conventional 100-150 nm thick ice layers, and enables controlled assembly of specific biological processes or synchronization of biological complexes in a targeted conformational state. This new method has been used for different projects. I will discuss the ChemiC technology and its applications in cryo-EM specimen preparation and imaging and will present the recent progress in further development of the technology for different purposes.

Biography

Qiu-Xing Jiang has obtained his PhD from Yale University and did his Postdoctoral training at Rockefeller University. He is currently an Associate Professor in UF and serves as the Faculty Director of Electron Microscopy (EM) at the UF Interdisciplinary Center for Biotechnology Research, where EM is used for revealing the structural basis of biological machineries. He has published more than 25 papers in reputed journals. His lab focuses on structural and functional studies of intracellular RNA-binding complexes and ion channels involved in membrane excitability and regulated secretion and have been developing new methods for cryo-EM imaging of single molecules.

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