An X-Ray Laser Structure of Rhodopsin-Arrestin Complex

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Serial femtosecond X-ray crystallography (SFX) using an X-ray free electron laser (XFEL) is a recent advancement in structural biology for solving crystal structures of challenging membrane proteins, including G-protein coupled receptors (GPCRs), which often only produce microcrystals. XFEL delivers highly intense X-ray pulses of femtosecond duration short enough to enable the collection of single diffraction images before significant radiation damage to crystals sets in. In this talk, I will present our efforts toward the first structure of arrestin bound to rhodopsin - a prototype of GPCR, including strategies, pitfalls and successes in crystallizing the rhodopsin-arrestin complex as well as methods of XFEL data collection and analysis, structure determination, and the validation of the structural model. The rhodopsin-arrestin crystal structure solved with SFX represents the first near-atomic resolution structure of a GPCR-arrestin complex, provides structural insights into understanding of arrestin-mediated GPCR signaling, and demonstrates the great potential of this SFX-XFEL technology for accelerating crystal structure determination of challenging proteins and protein complexes.