Super resolution for X-ray scattering and biological insights from its applications to dynamic DNA replication and repair complexes

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Biological small angle X-ray scattering (BioSAXS) is an under appreciated and under utilized method for structural analyses that accuractely defines solution conformations and assemblies that are directly relevant to connecting structures to biological insights. Bio-SAXS is the only true high-throughput structural biology method. It furthermore provides information on the entire complex including both ordered and flexible regions when interpreted with appropriate metrics and methods. We will present data on dynamic complexes acting in DNA replication and repair. The results will show that SAXS can probe at resolutions sufficient to distinguish different conformational states, characterize flexible macromolecules, and screen in high-throughput under most solution conditions. Methods with exemplary experimental results will be considered with a focus on interpretation tools. Results will be presented to show how SAXS can provide accurate shapes, assembly states, and comprehensive conformations in solution that inform biology in fundamental ways[1-9]. The approaches for measuring flexibility, conformational changes, and assembly processes discussed here are relevant for accurate understanding, simulation, and prediction of many mechanisms in cell biology and nanotechnology.

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