Small Angle X-ray Scattering Structural Characterization Of Quinones Oxidoreductases ζ-Crystallins Using SOLEIL Swing Beamline

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ABSTRACT

Quinone Oxidoreductase (QOR) is a class of enzyme known for catalyzing the reduction of quinone alongside the concomitant oxidation of a nicotinamide cofactor NAD(P)H. Usually QOR catalyze a two electrons transfer from NAD(P)H to the quinone (e. g. DT-Diaphorase[1]). However, the existence of a subclass of QOR prone to catalyzes one electron transfer, releasing semiquinone radical products, has been enlighten since the 1980s. Because the first discovered protein showing such catalytic properties has been identified in guinea pig lenses, they were given the name of ζ-crystallins (ZCr)[2]. Semiquinone products tend to react actively with dissolved O_2, leading to the production of H_2O_2. Interestingly, ZCr's physiological role may be either of structural or catalytic nature, as the protein showed its importance in mammals lenses correct light refraction[3] or for oxidative stress response in plants[4,5], or yeasts[6,7], respectively. As a result, study of the structural properties of ZCr is a requirement for the understanding and elucidation of the enzymatic mechanism behind the one electron transfer.

Small Angle X-ray Scattering method gave the opportunity to assess structural properties of ZCr in a native state in different conditions. The comparative study of recombinant ZCr from various organisms: mammals, plants, yeast and bacteria is of interest as differences in protein oligomeric state (monomeric, dimeric or tetrameric) are observed according to the specie. SAXS data combined with other structural data such as analytical Size Exclusion Chromatography, Gel electrophoresis and resolved crystal structures certainly is an added value for ZCr structural analysis.

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