

S50-1 X-ray crystallographic analysis of the early photo-intermediate of squid rhodopsin

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The signal transduction process in the visual photoreceptor cell is initiated by the photo-isomerization of the 11-cis retinal in rhodopsin. We have recently determined the crystal structure of squid rhodopsin, which is a member of Gq-type G-protein coupled receptors. Our next objective is to clarify how the light-induced conformational change of the active site in rhodopsin is propagated to the binding site of its cognate G-protein at the cytoplasmic surface. In this study, we performed the crystallographic analysis of the primary photoreaction intermediate bathorhodopsin. Since it would be expected that the structural change upon formation of bathorhodopsin is small, it is crucial to remove any bias that might originate from X-ray radiation damages during data collection. For this purpose, we utilized the reversible photo-conversion between bathorhodopsin and the initial unphotolysed state at 100K. Two diffraction data sets were collected from a single frozen crystal that was exposed alternately to blue and orange-red laser beams. The difference electron density map derived from these data sets has clear positive and negative densities around the central region of the retinal polyene chain. The result suggested that upon formation of bathorhodopsin, the central moiety of the retinal undergoes a large movement towards the cytoplasmic side with small movements of the β -ionone ring and the Schiff base.