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Photoactivation Reduces Side-Chain Dynamics of a LOV Photoreceptor

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We used neutron scattering experiments to probe the conformational dynamics of the light, oxygen, voltage (LOV) photoreceptor PpSB1-LOV from Pseudomonas putida in both the dark- and light-state. Global protein diffusion and internal macromolecular dynamics were measured using incoherent neutron time-of-flight and backscattering spectroscopy on the picosecond to nanosecond time scales. Mean square displacements of localized internal motions and effective force constants describing the resilience of the proteins were determined on the respective time scales. Photoactivation significantly modifies the flexibility and the resilience of PpSB1-LOV. On the fast picosecond time range small changes in the MSD and effective force constants are observed, which are enhanced on the slower nanosecond time scale. Photoactivation results in a slightly larger resilience of the photoreceptor on the fast picosecond time scale, whereas on the nanosecond range a significant less resilient structure of the light-state protein is observed. For a residue resolved interpretation of the experimental neutron scattering data we analyzed MD simulations of the PpSB1-LOV X-ray structure.

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