ULTRAFAST SHORT-RANGE ELECTRON TRANSFER DYNAMICS IN BIOLOGY

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Studies shed light on the molecular mechanisms of photo-induced electron transfer, central to many biological functions such as photosynthesis and DNA repair, are of great importance. By integration of the site-directed mutagenesis and femtosecond-resolved spectroscopy, we report here the systematic studies of ultrafast dynamics of an electron-transfer cycle, both forward and backward, in a model system of *D. vulgaris* flavodoxin in its oxidized state. Upon excitation of flavin prosthetic cofactor, we determined the forward quenching dynamics, by the flanking aromatic tryptophan and tyrosine at the van der Waals contact, in hundreds of femtoseconds and the backward transfer on the order of picoseconds, respectively. The latter occurs on the similar time scale of the fast active-site solvation, which indicates their dynamic correlation. Remarkably, we also observed the moderate alternation of the dynamics during the evolution of charge recombination process. A description of the manner in which local protein solvation is utilized to modulate the electron transfer dynamics will be presented.