DIRECT OBSERVATION OF DNA REPAIR IN PHOTOLYASE

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Photolyase splits cyclobutane ring of pyrimidine dimer (CPD) in DNA in a light (350-500nm) driven reaction and thus reverses the harmful effects of far-UV (200-300nm). Through resonance energy transfer from photoantenna MTHF or directly by absorption of visible light, reduced flavin cofactor ($FADH^-$) transfers an electron to CPD which subsequently splits into two pyrimidines. Concomitantly, an electron is transferred back to the oxidized neutral radical ($FADH^o$) to restore the active form ($FADH^-$). With femtosecond resolution we followed the functional evolution and observed forward and backward electron transfer reactions as well as the entire DNA-repair process. These dynamics occur in the picosecond time scale, raveling the ultrafast nature of DNA-repair mechanism