FEMTOSECOND DYNAMICS OF RESONANCE ENERGY AND ELECTRON TRANSFER IN DNA-PHOTOLYASE ENZYME

CHAITANYA SAXENA, DONGPING ZHONG, *OSU Biophysics Program, The Ohio-State University, Columbus, Ohio-43210, USA*.

DNA photolyase enzyme splits the cyclobutane ring of pyrimidine dimers (CPDs) in DNA in a light (350-500nm) driven reaction and thus reverses the harmful effects of far-UV (200-300nm). The folate cofactor MTHF in the enzyme harvests the visible energy and transfers it to another cofactor FADH-. Reduced flavin (FADH-) in turn uses this energy to repair the CPDs by an electron transfer process. With femtosecond resolution we used fluorescence up-conversion and transient absorption techniques to understand the molecular mechanism, especially the kinetics of this energy and electron transfer processes in the DNA photolyase. The experimental results show that the energy and electron-transfer processes are ultrafast, occurring in tens of picoseconds. These studies facilitate our further complete mapping of entire functional processes of repairing damaged DNA at the local atomic scale.