

A Unified Electron-Transfer Mechanism for DNA Repair by Photolyases

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UV radiation can damage DNA and such lesion may eventually lead to skin cancer. Photolyase, a photo-repair machine in nature, can revert such damage with high efficiency. Here, by integrating femtosecond spectroscopy and molecular biology, we have completely mapped out the entire repair evolution at the most fundamental level with unprecedented detail and thus reveal the complete repair photocycle. A unified electron-transfer mechanism was elucidated for all photolyases in three-life kingdoms and the critical role of the unique folded cofactor structure at the conserved active-site configuration was determined. Such results provide the basic knowledge for potential biomedical applications of curing skin cancer.