

DNA-mediated charge transport for DNA repair

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MutY, like many DNA base excision repair enzymes, contains a [4Fe4S]²⁺ cluster of undetermined function. Electrochemical studies of MutY bound to a DNA-modified gold electrode demonstrate that the [4Fe4S] cluster of MutY can be accessed in a DNA-mediated redox reaction. Although not detectable without DNA, the redox potential of DNA-bound MutY is ≈ 275 mV versus NHE, which is characteristic of HiPiP iron proteins. Binding to DNA is thus associated with a change in [4Fe4S]^{3+/2+} potential, activating the cluster toward oxidation. Given that DNA charge transport chemistry is exquisitely sensitive to perturbations in base pair structure, such as mismatches, we propose that this redox process of MutY bound to DNA exploits DNA charge transport and provides a DNA signaling mechanism to scan for mismatches and lesions *in vivo*.

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