DNA repair glycosylases with a [4Fe–4S] cluster: A redox cofactor for DNA-mediated charge transport?

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Abstract

The [4Fe–4S] cluster is ubiquitous to a class of base excision repair enzymes in organisms ranging from bacteria to man and was first considered as a structural element, owing to its redox stability under physiological conditions. When studied bound to DNA, two of these repair proteins (MutY and Endonuclease III from *Escherichia coli*) display DNA-dependent reversible electron transfer with characteristics typical of high potential iron proteins. These results have inspired a reexamination of the role of the [4Fe–4S] cluster in this class of enzymes. Might the [4Fe–4S] cluster be used as a redox cofactor to search for damaged sites using DNA-mediated charge transport, a process well known to be highly sensitive to lesions and mismatched bases? Described here are experiments demonstrating the utility of DNA-mediated charge transport in characterizing these DNA-binding metalloproteins, as well as efforts to elucidate this new function for DNA as an electronic signaling medium among the proteins.

Full Text