DNA repair and free radicals: the case of the spore photoproduct lyase, a Radical-SAM enzyme

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The DNA of all organisms is subject to modifications upon exposure to a wide variety of chemical and physical agents. Among them, solar ultraviolet radiation is known to induce dimerization reactions between adjacent pyrimidines. In spores of some bacteria such as *Bacillus subtilis* the only photoproduct generated upon exposure to UV light is 5-thyminyl-5,6-dihydrothymine (spore photoproduct, SP). The extreme resistance of spores to UV radiation is due to the presence of a specific and very efficient repair enzyme, the spore photoproduct lyase (SP Lyase) that directly reverts SP to two unmodified thymines upon germination (scheme). SP Lyase belongs to a superfamily of [4Fe-4S] iron-sulfur enzymes, named "Radical-SAM", involved in a great variety of biosynthetic pathways and metabolic reactions that proceed via radical mechanisms (1). Recent biochemical and mechanistic studies by W.L. Nicholson's (2), J. Broderick's (3) groups and by our laboratory (4) have provided detailed insights into the mechanism of the reaction catalyzed by SP Lyase and how this enzyme controls high potential intermediate free radicals. These data will be discussed in the general context of the fascinating chemistry of "Radical-SAM" enzymes.

References:

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