The Effects of Expressing DNA Repair Enzymes, UVDE and cv-pdg, in E. coli cells under UVB Light

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Ultraviolet light affects millions of people every year in the form of cancer, and other skin diseases, by inducing damage in DNA. A direct comparison of the effects of enzymes for alternative DNA repair pathways, UVDE (effective against CPD and 6-4PP damage) and cv-pdg (effective against CPD damage), on E. coli cells, deficient in DNA repair, under UVB light were investigated. It was hypothesized that expression of the recombinant DNA of the E. coli cells, including the UVDE and cv-pdg genes, would have a significant increase in survival compared to the cells without the genes. Furthermore, that the transformed cells that were initially deficient in repair enzymes (UvrA and RecA), would have survival rates comparable to the wild type strain of E. coli. A model for testing these genes was created using bacteria, by inserting the 2 genes into E. coli cells, through transformations by electroporation. E. coli cells with, and without the genes were exposed to 3 doses of UVB, and survival curves were developed. The cells expressing the genes significantly increase in survival compared to those without either gene, comparable to the wild type. UvrA deficient cells increased from 0.4% survival to 38% survival, when expressing cv-pdg under 30J/m2 of UVB. Those with Xeroderma Pigmentosum, an inherited deficiency of DNA repair associated with uvrA, have hypersensitivity to the sun, developing skin cancer at a young age. The effectiveness of the enzymes for alternative DNA repair pathways suggests future drug development for the prevention of skin cancer in humans.

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