The Effect of Ascorbic Acid on DNA Repair-Deficiency: A Study on Saccharomyces cerevisiae Strains

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Mismatch repair (MMR) deficiency in DNA is an ongoing problem as a factor behind DNA mutations and various cancers, including colorectal cancer and gliomas. Understanding how to strengthen DNA repair mechanisms is crucial for developing potential treatments and prevention strategies. This study investigated the effect of ascorbic acid on the DNA repair efficiency of MMR-deficient Saccharomyces cerevisiae strains (MSH2 and MSH3) compared to a wild-type strain (BY4741). Yeast strains were exposed to varying concentrations of ascorbic acid (0 mM, 1 mM, 5 mM, 10 mM, 15 mM, and 20 mM) after being induced with DNA damage via UV light. The results indicated that ascorbic acid significantly improved living cell density in the MSH3 strain comparably to the BY4741 strain at a concentration of 10 mM, with p-values of $p<0.05$. This suggests that moderate ascorbic acid concentrations can effectively improve DNA repair mechanisms, rejecting the null hypothesis prompting otherwise. Conversely, MSH2 strains displayed mixed results, indicating variability in the responses of mutant strains to ascorbic acid treatment. Future research should explore the effects of other antioxidants and their potential threshold effects on DNA repair to further assess strategies for combating DNA damage in repair-deficient cells, ultimately contributing to cancer prevention efforts.

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