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Study of cell protective effects of alcohols against UV-C radiation

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In previous study of the effects of irradiation on *Escherichia coli* DBM 272 bacteria, we found that simple alcohols such as methanol or ethanol decrease the radiation sensitivity of cells towards ionizing radiation, probably by scavenging OH radicals in the irradiated system. A similar effect of decrease in radiation sensitivity occurred when the system was irradiated with UV-C (254 nm) radiation. However, OH radicals are unlikely to form in sufficient amounts in aqueous solutions under UV-C radiation and the mechanism of radical scavenging should not play a significant role in affecting radiation sensitivity. Therefore, the protective effect of alcohols was studied in connection with singlet oxygen being produced in the UV-C irradiated system with Rose Bengal photosensitizer added. A singlet oxygen production was monitored using a Singlet oxygen sensor green chemical probe; reaction of chemical probe with singlet oxygen produces a fluorescent endoperoxide. Adding ethanol to the irradiated system resulted in decrease of the fluorescence signal, which indicates a decrease in concentration of singlet oxygen formed under UV-C irradiation. Thus, ethanol is likely to quench singlet oxygen in a system under study. This quenching does not occur with the use of methanol. When irradiating *E. coli* cells in the presence of ethanol and Rose bengal for higher singlet oxygen production, there was a greater reduction in the radiation sensitivity of the cells compared to the system without Rose bengal. Higher concentration of ethanol caused greater protection of cells. Thus, it is likely that ethanol can scavenge singlet oxygen and thus increase the protection of bacteria from the effects of UV-C radiation. However, the comparison of protective effect of various alcohols in the field of ionizing and non-ionizing radiations requires furthermore detailed and systematic study.

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