DNA AS A SOLAR DOSIMETER IN THE OCEAN

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Increased solar UV[B] in the ocean may be one of the results of atmospheric ozone depletion and may cause deleterious effects on marine organisms. The primary lesion induced by UV[B] in biological systems is DNA damage. While physical measurements of solar UV[B] penetration into the sea have been made, depth and magnitude of actual DNA damage has yet to be demonstrated. We have quantitated UV[B]-induced photoproducts (cyclobutane pyrimidine dimers) in DNA molecules exposed to solar UV at the surface and at various depths in clear, tropical oceanic waters off Lee Stocking Island, Bahamas. ^{14}C-thymidine-labeled DNA was placed in quartz cuvettes polished on all four sides and suspended horizontally in special holders at selected depths for exposures of up to five days. Simultaneous measurements of light were made with an underwater photometer. Following exposures, DNA samples were transported to the laboratory and the pyrimidine dimers induced were quantitated using a radiochromatographic assay. The attenuation of the yield of dimer was approximately linear between 0 and 1.0 m. However, at 3.0 m, the yield was considerably higher than predicted by the earlier portion of the curve. Preliminary laboratory experiments with DNA in seawater tanks using a solar simulating light source markedly underestimated the yield of dimers found under field conditions. Implications of these results and application of this biomolecular dosimeter system will be discussed.