Solar uv radiation-induced dna bipyrimidine photoproducts: Formation and mechanistic insights

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This review chapter presents a critical survey of the main available information on the UVB and UVA bipyrimidine photoproducts which constitute the predominant recipient classes of photo-induced DNA damage. Evidence is provided that UVB irradiation of isolated DNA in aqueous solutions and in cells gives rise to the predominant generation of cis-syn cyclobutane pyrimidine dimers (CPDs) and, to a lesser extent, of pyrimidine (6-4) pyrimidone photoproducts (6-4PPs), the importance of which is strongly primary sequence dependent. A notable change in the photoproduct distribution is observed when DNA either in the dry or in desiccated microorganisms is exposed to UVC or UVB photons with an overwhelming formation of 5-(?-thymidyl)-5,6-dihydrothymidine, also called spore photoproduct (dSP), at the expense of CPDs and 6-4PPs. UVA irradiation of isolated and cellular DNA gives rise predominantly to bipyrimidine photoproducts with the overwhelming formation of thymine-containing cyclobutane pyrimidine dimers at the exclusion of 6-4PPs. UVA photons have been shown to modulate the distribution of UVB dimeric pyrimidine photoproducts by triggering isomerization of the 6-4PPs into related Dewar valence isomers. Mechanistic aspects of the formation of bipyrimidine photoproducts are discussed in the light of recent photophysical and theoretical studies.

Cellular DNA photodamage

Cyclobutane pyrimidine dimmers

Dewar valence isomers

Pyrimidine (6-4) pyrimidone photoproducts

Spore photoproduct

DNA

guanine quadruplex

pyrimidine dimer

solution and solubility

adverse effects

archaeon

Bacteria

chemical structure

chemistry

DNA damage

genetics

human

isolation and purification

metabolism

radiation response

skin

solution and solubility

stereoisomerism

sunlight

ultraviolet radiation

Archaea

Bacteria

DNA

DNA Damage

G-Quadruplexes

Humans

Molecular Structure

Pyrimidine Dimers

Skin

Solutions

Stereoisomerism

Sunlight

Ultraviolet Rays