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DNA damage induction and repair in human respiratory epithelium and human epidermis exposed to broadband ultraviolet radiation.

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Phototherapy has been widely used to treat inflammatory and immune-mediated skin diseases. Recently, phototherapy has been applied to treat inflammatory diseases of the nasal mucosa such as allergic rhinitis and nasal polyps. However, the risks associated with UV induced DNA damage in nasal mucosa are not well understood. We used DNA photoproducts as biomarkers to address this issue. Radioimmunoassay was used to quantify cyclobutane pyrimidine dimer and (6-4) photoproduct induction and repair in DNA purified from two milieu, including nasal cytology samples from patients undergoing phototherapy and in artificial 3-D tissues produced by MatTek. In patients, DNA damage frequencies were determined prior to and immediately after treatment and at increasing times post-treatment. We found significant levels of DNA damage immediately after treatment and efficient removal of the damage within a few days in response to DNA repair mechanisms or dilution by cell proliferation. Patients biopsied two months after treatment showed no persistent damage and no DNA damage-retaining cells in the nasal epithelium. To better understand the molecular response of the nasal epithelium to DNA damage we conducted parallel experiments in artificial respiratory epithelium (Epi-Air) and epidermis (Epi-Derm). Induction frequencies were significantly lower in the artificial epidermis compared to the respiratory epithelium at the same dose due to shielding by the stratum corneum. However, repair rates in these two tissues were very similar and comparable to that observed in human skin. Our results suggest that the DNA damage response of respiratory epithelia is very similar to that of the human epidermis.