

Rearrangement and Depletion of Human Skin Folate after UVA Exposure

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Abstract : Human skin color is thought to have evolved to balance sufficient photochemical synthesis of vitamin D versus the need to protect not only DNA but also folate from degradation by ultraviolet light (UV). Although the risk of DNA damage and subsequent skin cancer is related to light skin color, the effect of UV on skin folate of any species is unknown. Here we show that UVA irradiation at 13 mW/cm² for a total exposure of 187 J/cm² (similar to a maximal daily equatorial dose) induced a significant loss of total folate in epidermis of ex vivo white skin. No loss was observed in black skin samples, or in the dermis of either color. Interestingly, while the concentration of 5-methyltetrahydrofolate (5-MTHF) fell in white epidermis, a concomitant increase of tetrahydrofolic acid was found, though not enough to maintain the total pool. These results demonstrate that UVA indeed not only decreases folate in skin, but also rearranges the pool components. This could be due in part to the reported increase of NADPH oxidase activity upon UV irradiation, which in turn depletes the NADPH needed for 5-MTHF biosynthesis by 5,10-methylenetetrahydrofolate reductase. The increased tetrahydrofolic acid might further support production of the nucleotide bases needed for DNA repair. However, total folate was lost at a rate that could, with strong or continuous enough exposure to ultraviolet radiation, substantially deplete light colored skin locally, and also put pressure on total body stores for individuals with low intake of folate.

Keywords : depletion, folate, human skin, ultraviolet

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