Development of a dosimetric tool to measure human UVA exposures

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Introduction

Humans in their day-to-day lives are exposed to solar ultraviolet (UV) radiation. These solar UV exposures can be separated into UVB exposures (280nm to 320nm) and UVA exposures (320 to 400nm). Most acute responses of humans to UV exposure occur as a result of UVB exposures, as these wavelengths are highly sensitive in creating a human biological response. This however does not result in UVA radiation not having an impact on human UV exposures and health. UVA can cause erythema in human skin, yet, the exposures required to create such a response is much larger than UVB radiation. UVA radiation penetrates much deeper into human skin tissue than UVB, resulting in impacts that are not as acute, taking many years to manifest. UVA exposures are associated with wrinkling, loss of skin elasticity, ocular disorders and it has been implicated in the development of skin cancers.

Methods/Results

Our research group has developed a personal UV dosimeter that can quantitatively assess UVA exposures. The chemical phenothiazine, cast in thin film form and which is responsive to both the UVA and UVB part of the spectrum was used and filtered with mylar. This combined system responded to the UVA wavelengths only and underwent a change in optical absorbance as a result of UVA exposure. Preliminary results indicate that this UVA dosimeter saturates reasonably quickly when exposed to sunlight. Results will be presented on the dosimeter's characteristics and preliminary results indicating how this tool may be used in environmental exposure risk assessment.

Discussion

Although the UVA dosimeter saturates reasonably quickly, it is not an insurmountable problem to extend the dynamic range of the dosimeter. This may be done using a similar technique to that used to extend the dynamic range of polysulphone as a UVB dosimeter by a factor of approximately 4 to 5 by using a carefully selected and characterized neutral density filter.