Impact of skin pigmentation on rate of rise of serum 25OHD following simulated sunlight exposures to habitually exposed skin sites

Mark D Farrar¹, Ann R Webb², Richard Kift², Jacqueline L Berry³, Andy Vail⁴, Lesley E Rhodes¹

¹Centre for Dermatology, Institute of Inflammation and Repair, University of Manchester, Manchester Academic Health Science Centre, Manchester, UK
²School of Earth, Atmospheric and Environmental Sciences, University of Manchester, Manchester, UK
³Specialist Assay Laboratory (Vitamin D), Endocrinology and Diabetes Research Group, Institute of Human Development, University of Manchester, Manchester Academic Health Science Centre, Manchester Royal Infirmary, Manchester, UK
⁴Centre for Biostatistics, Institute of Population Health, University of Manchester, Manchester Academic Health Science Centre, Manchester, UK

Exposure of skin to UVB in sunlight increases serum 25-hydroxyvitamin D (25OHD) concentration in people of both light and dark skin types. However, human intervention studies of impact of pigmentation on the vitamin D biosynthetic pathway have employed various skin sites, UVR emission and protocols, with conflicting results. Thus, the influence of skin pigmentation remains unclear.

We performed an intervention study in healthy volunteers (aged 20-60 yrs) of different skin colour. A total of 109 white Caucasians (skin type I-IV) and 15 South Asians (type V) received simulated summer sunlight exposures, 1.3 SED 3-times weekly (95% UVA, 5% UVB). Irradiations were in a whole body irradiation cabinet with subjects wearing T-shirt and shorts to reveal commonly exposed skin sites (∼35% surface area). Blood samples were taken weekly for serum 25OHD assay and data for 3 weeks of irradiations were analysed by repeated measures analysis of variance.

Serum 25OHD levels increased in the white Caucasian group from mean (SD) 17.6 (7.6) ng/mL at baseline to 25.4 (6.3) ng/mL at 3-weeks and in the S. Asian group from 6.4 (1.9) ng/mL at baseline to 9.7 (2.8) ng/mL. Analysis revealed the increase in serum 25OHD over the course of exposures was significant (p<0.001) in both groups. There was a significant interaction of skin type (p=0.001) reflecting a significantly higher rate of increase in the white Caucasian group. Increase in 25OHD in the S. Asian group remained linear over the 3 weeks of exposures. In contrast, the response in the white Caucasian group had a non-linear component, with the magnitude of 25OHD rise decreasing over the course.

Under rigorously controlled exposure to simulated sunlight of commonly exposed skin areas, significant increase in 25OHD is seen in people of both pigmented and non-pigmented skin, with skin type having a significant impact on rate of rise.