A Study on Quantifying Personal UV Exposure, Vitamin D Status and Their Relationship within a Group of High School Students in an Alpine Environment

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Vitamin D's essential role in human health is increasingly being recognized. However, the quantitative relationship between the cutaneous synthesis of vitamin D and personal UV exposure is unclear and hard to define. The purpose of this study was to characterize this relationship in a group of high school students in an alpine environment (Davos, Switzerland). The personal UV exposure of each participant was monitored over a half year (March to August) using state-of-the-art electronic dosimeters, while blood samples were taken on a monthly basis to determine the serum concentration of 25-hydroxyvitamin D3 (25(OH)D3). Daily logbook provided information to correct the UV exposure for sunscreen, body area and dietary intake. During school days students were only exposed to 1.7% of the ambient UV irradiance, whereas 85% of the cumulative UV dose was obtained on weekends and holidays. All students were vitamin D de- or insufficient at the beginning of March; the status increased to sufficient levels by summertime. The increase in vitamin D correlated well (r = 0.89) with the measured personal UV exposure, yielding a mean increase in serum 25(OH)D3 concentration of 0.38 ± 0.22 ng/ml per 100 J/m^2 of vitamin D-weighted UV exposure. Even in an alpine climate, in wintertime vitamin D insufficiency seems inevitable due to both geographical circumstances and minimal skin exposure to UV radiation. As a result, during winter the intake of vitamin D supplements should be considered, whereas during summer adequate vitamin D concentrations can be easily achieved just by small but regular sun exposure.

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