Seasonal ultraviolet B light availability in European countries and its impact on serum 25-hydroxyvitamin D

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The major source of vitamin D in humans is the dermal synthesis of cholecalciferol in the presence of ultraviolet B (UVB) radiation(1). Food sources of vitamin D are few; typical mean intakes in populations within the European Union are generally around 3–7.5 µg/d(2). Recent research has shown that 13 % of European individuals have vitamin D deficiency (serum 25-hydroxyvitamin D [25(OH)D] concentrations <30 nmol/L(1)) on average in the year(3). The objectives of this work were to assess the availability of UVB (Jm−2) across Europe and to compare this UVB data with monthly serum 25(OH)D concentrations (nmol/L) in two case-study Northern and mid-latitude European countries (Tromsø, Norway [69°N] and Ireland [51–54°N], respectively) as exemplars.

UVB availability was modelled for countries across Europe, as previously described and validated(4). The results showed that UVB availability increased with decreasing latitude (from 69°N to 35°N) (data not shown). Standardized serum 25(OH)D concentrations from the National Adult Nutrition Survey in Ireland and from the Tromsø 6 cohort study in Tromsø, Norway were used to generate monthly means and standard deviations. Fig 1 shows the seasonal variation in both the UVB availability (average of 10 year period) and serum 25(OH)D concentrations for Ireland and Northern Norway over a typical 12 month period. Using a cut-off of 1000 Jm−2, below which the capacity for dermal synthesis of vitamin D is insufficient, showed that Ireland and Northern Norway had 5 and 8 months of the year, respectively, where UVB fell under this threshold. Despite this, serum 25(OH)D concentrations of Norwegian adults is noticeably higher than that of Irish adults during these vitamin D winter periods. The seasonal fluctuations in serum 25(OH)D concentrations was largely absent in Norwegian adults, despite clear variation in UVB availability (Fig 1).

The mean daily intake of vitamin D by Irish adults in 2009/10 was 5 µg/d compared to 12 µg/d in Norwegian adults in 2011. The higher intake in Norway stems from a higher rate of vitamin D supplement usage and greater fish consumption compared to that in Ireland. In conclusion, increasing the vitamin D intake (via food fortification and/or supplement use) can ameliorate the impact of low UVB availability on serum 25(OH)D status in Europe.

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