

Clinical and Environmental Determinants of Vitamin D Status in Abu Dhabi

Lessan N¹, Hannoun Z¹, Buckley A¹, Holick M F², Barakat M T¹

¹Imperial College London Diabetes Centre Abu Dhabi, United Arab Emirates, ²Department of Medicine, Section of Endocrinology, Nutrition, and Diabetes, Vitamin D, Skin, and Bone Research Laboratory, Boston University Medical Center, Boston, Massachusetts, USA

Introduction

In spite of its sunny climate and low latitude, vitamin D deficiency is highly prevalent in the UAE; serum 25(OH)D was < 50 nmol/l in 58.1% of 36728 adult and pediatric patients attending our own centre who reported taking vitamin D supplementation. The UAE is subject to environmental factors such as atmospheric dust, high ground level ozone and high humidity, that affect the scattering of incident solar radiation; we therefore investigated their impact on vitamin D photosynthesis in vitro.

Aim

To assess in vitro conversion of 7-dehydrocholesterol into previtamin D, vitamin D, and the inactive isomers tachysterol and lumisterol, by direct sunlight at ground level in Abu Dhabi.

Methods

Borosilicate ampoules containing 7-dehydrocholesterol dissolved in ethanol were sealed under argon¹. The ampoules were exposed to direct, unobstructed sunlight at the Imperial College Diabetes Centre, Abu Dhabi at hourly intervals from 0800 to 1600 on one day each month between January and December 2012. The resulting proportions of previtamin D, lumisterol and tachysterol formed in each ampoule were determined by high performance liquid chromatography at Boston University.

Results

The highest measured proportion of previtamin D and vitamin D synthesised was 7.51 %, in the ampoule exposed between 1200 and 1300, in July. By comparison, 3.5% was converted during the time period between 1200 and 1300 in January. The production of previtamin D varied with time of day, with < 2% conversion at 0800-0900 and 1600-1700 time periods regardless of time of year. Conversion to previtamin D and vitamin D correlated with predicted UVB intensity by the

SPCTRL2 calculator², weighted by the action spectrum for vitamin D synthesis³ (Spearman $r = 0.925$, $p < 0.0001$). Total daily previtamin D conversion, estimated as the AUC of the graph of % conversion versus time of day, varied throughout the year; at the January nadir, the total converted was only 34% of the July peak.

Conclusions

The proportion of 7-dehydrocholesterol converted into previtamin D in vitro by sunlight in Abu Dhabi was comparable with observations from similar studies performed worldwide⁴⁻⁷. Hence the high prevalence of vitamin D deficiency reported in the UAE is better explained by individual, rather than environmental, factors.

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