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Do sunscreens block vitamin D production? A critical review by an international panel of experts

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In this issue of the BJD, an international group of experts in endocrinology, dermatology, photobiology, epidemiology and anthropology present their review of the use of sunscreens and their impact on vitamin D production.[1] Their review covers the period from 1996 to 2017, with a 1-day meeting in 2017 to discuss their observations and ultimately provide their findings in this extensively documented and well-referenced publication. Their challenge was to provide recommendations for the best ways of achieving optimal vitamin D status with the judicious use of sunscreens to protect the skin from solar damage.

Most individuals obtain the majority of their vitamin D from its photoproduction in the skin, as food sources are limited. Vitamin D production entails the conversion of 7-dehydrocholesterol to previtamin D following ultraviolet (UV)B exposure, with subsequent isomerization to vitamin D. The most widely used marker of vitamin D sufficiency is the circulating level of 25-hydroxyvitamin D. Most guidelines, such as those from the Institute of Medicine (now called the National Academy of Medicine), recommend that levels should be 50 nmol L^{-1} or higher, although this may not be optimal for all patient populations.[2] Although sunlight is readily available at least most of the year in most latitudes, vitamin D deficiency remains a globally important issue, generally in those countries where sun exposure is avoided. On the other hand, solar exposure has its detrimental effects by inducing painful sun burns, photoageing and skin cancer over the longer term. Thus the challenge addressed by this panel was how to balance protection of the skin from solar radiation while maintaining vitamin D sufficiency.

The sun protection factor (SPF) listed on all sunscreens is the ratio of the solar simulated radiation with and without the sunscreen (applied at 2 mg cm^{-2}) to produce 1 minimal erythemal dose. Although UVB is more effective at causing erythema, UVA also contributes, comprising around 95% of solar radiation. Thus a sunscreen that is highly effective against both UVA and UVB will actually allow more UVB exposure per SPF than one that has less UVA protection.

Both UVA and UVB can cause cancer, but by different mechanisms.[3] The panel noted that laboratory tests of the effectiveness of sunscreens to block UVB stimulation of vitamin D

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Conflicts of interest
None to declare.

production utilized the whole range of UVB (280–320 nm), with the shorter wavelengths being more effective in generating vitamin D, whereas much of the lower end of this range (< 295 nm) was attenuated by the ozone layer with outdoor exposure. Thus, when tested outdoors, sunscreens with a given SPF, especially with high UVA protection, were less likely to block vitamin D production than when tested in the laboratory. This conclusion was supported by studies in populations vacationing in sunny locations where vitamin D levels did not seem to differ between those applying the sunscreen and those who did not, with exposure time and body surface area exposed being equivalent. Thus the review concludes that sunscreens can be effective in preventing erythema from solar exposure without limiting the benefits with respect to vitamin D production. However, populations that avoid solar exposure for cultural or medical reasons should be screened for vitamin D deficiency and treated appropriately with supplementation.

The important take-home message from this timely review is that with respect to sunscreens and sunlight a balance can be achieved between the beneficial and harmful effects of solar radiation. Sunscreens can help achieve that balance.

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