perplexity

Justification for Reconsidering Sunlight Exposure: Analysis of Weller's "Sunlight: Time for a Rethink?"

In the comprehensive article "Sunlight: Time for a Rethink?" by Richard B. Weller, a compelling case is presented for reconsidering our current medical approach to sunlight exposure. The paper argues that while ultraviolet radiation (UVR) is a known skin carcinogen, the benefits of sunlight exposure may outweigh the risks for many populations, particularly those with lighter skin living in higher latitudes. This report examines the multifaceted evidence presented by Weller to justify his conclusion that a more balanced approach to sun exposure is needed.

Epidemiological Evidence on All-Cause Mortality

The cornerstone of Weller's argument rests on epidemiological studies that demonstrate a counterintuitive relationship between sun exposure and mortality. Despite the established carcinogenic effects of UVR on skin, no studies link increased sun exposure to higher all-cause mortality rates. Instead, large cohort studies suggest the opposite.

In the Melanoma in Southern Sweden study, researchers followed 30,000 women for 25 years and found that sun-seeking behavior was inversely correlated with all-cause mortality, despite a higher incidence of melanoma cases in those with more sun exposure[1]. The reduction in all-cause mortality was particularly related to lower rates of cardiovascular death. Similar findings emerged from the much larger UK Biobank cohort study of approximately 377,000 white-skinned participants, which found that increased sun exposure correlates with reduced all-cause mortality. This reduction was primarily related to decreased cardiovascular mortality but also to reduced cancer mortality, including skin cancer[1].

After correcting for demographic, socioeconomic, behavioral, and clinical confounders, the study found a hazard ratio of 0.94 (95% confidence interval = 0.92-0.96) for each 300 km of domicile further south (and thus increased sun exposure). This equates to an increased lifespan of 16 days for each 300 km lower latitude[1]. These data confirm that for white-skinned inhabitants of North European countries, the benefits of sunlight exposure outweigh the risks.

The Vitamin D Paradox

Another critical element of Weller's argument is the "vitamin D paradox"—the discrepancy between observational studies linking higher vitamin D levels with better health outcomes and the failure of vitamin D supplementation trials to demonstrate similar benefits. This paradox suggests that sun exposure provides health benefits through mechanisms independent of vitamin D production.

Numerous diseases, including hypertension, cardiovascular disease, cerebrovascular disease, metabolic disease, multiple sclerosis (MS), and cancer, are all associated with low measured vitamin D levels[1]. However, meta-analyses of multiple randomized controlled clinical trials of oral vitamin D supplementation fail to show any benefit in reducing these conditions[1]. The two largest randomized placebo-controlled trials of vitamin D supplementation—the VITAL study (>25,000 participants) and ViDA study (>5000 participants)—concluded with negative primary endpoints for incident cardiovascular disease and incident cancer[1].

This contradiction between observational studies and intervention trials suggests that vitamin D levels may serve as a biomarker for sun exposure, with the actual health benefits coming from other UV-dependent mechanisms. As Weller notes, "The strong observational relationship between higher observed vitamin D levels and better health in all these domains stands in contrast to the large body of negative intervention trials and Mendelian randomization studies" [1].

Nitric Oxide and Cardiovascular Health Benefits

Weller identifies the photomobilization of nitric oxide (NO) from cutaneous stores as a critical vitamin D-independent pathway through which sunlight provides health benefits. The skin contains large stores of nitrogen oxides, largely as nitrate, nitrite, and S-nitrosothiols, which can be photoreduced by UVA radiation in the presence of thiols[1].

The author and collaborators have demonstrated that UVA irradiation of human volunteers mobilizes nitric oxide from cutaneous stores to the circulation, lowering blood pressure through arterial dilatation, independently of temperature[1]. Importantly, UVA was used because it does not synthesize vitamin D, thus demonstrating the vitamin D-independent nature of UV-induced blood pressure reduction.

In an epidemiological study of over 340,000 American patients undergoing dialysis, with blood pressure measured thrice weekly at over 2,000 different dialysis centers across the United States, the researchers confirmed that UV exposure correlates inversely with blood pressure, independent of temperature[1]. This beneficial hypotensive effect was more marked in White than in Black Americans and greater for UVB than for UVA[1].

This mechanism helps explain the well-documented latitudinal and seasonal variations in population blood pressure and cardiovascular mortality. Population blood pressure correlates directly with latitude, with approximately 25% of variance in blood pressure accounted for by latitude in the pre-antihypertensive treatment era[1]. In the UK, the summer-to-winter variation in population blood pressure is 5.6/3.3 mmHg, which can be causally linked to the 23% higher cardiovascular mortality in winter[1].

Evolutionary Evidence for Sunlight's Importance

Weller's argument is further strengthened by evolutionary evidence regarding skin pigmentation. The repeated and independent evolution of pale skin in populations living at high latitudes with lower ambient UV underscores the importance of sun exposure for health[1].

Modern humans have been present in Europe for around 40,000 years and East Asia for around 60,000 years, yet pale skin genotypes are much more recent, occurring within the last 30,000

years[1]. Strong selective pressures for pale skin variants have only been present within European populations for the last 5,000 years, during which time light skin variants in SLC24A5 and SLC45A2 have become fixed[1]. The marked strengthening of selection for pale skin variants (2-10% per generation) is equivalent in effect size to genetic variants coding for lactase persistence and malaria resistance[1].

Interestingly, this powerful selection occurs in Europe after the development of farming, around 10,000 years before present. Similar timing is observed in East Asia, where pale skin phenotypes became prevalent as farming developed in Northern China[1]. This suggests that the shift from foraging to farming lifestyles, marked by a reduction in quality and diversity of diet and increased settlement-based infectious diseases, created selective pressures favoring pale skin in high-latitude locations[1].

The Sunlight Quartet and Disease-Specific Evidence

To systematically identify conditions where sunlight exposure might be beneficial, Weller proposes the "Sunlight Quartet" approach. This involves looking for conditions that demonstrate: 1) a latitudinal gradient, 2) seasonal variation, 3) correlation with measured vitamin D levels, and yet 4) no benefit from vitamin D supplementation or Mendelian randomization proxy measures[1].

Multiple sclerosis (MS) is presented as the paradigmatic example, with strong evidence for all four criteria. MS shows a clear latitude-dependent prevalence, with increasing rates as distance from the equator increases[1]. It also demonstrates seasonal variation in disease activity and correlates with vitamin D levels, yet vitamin D supplementation shows minimal benefit[1]. The first controlled pilot trial of UVB phototherapy in the treatment of clinically isolated syndrome (an early form of MS) showed a trend toward reduced relapse and significant normalization of markers of immune dysfunction[1].

The COVID-19 pandemic provided another illustration of sunlight's potential benefits. COVID-19 mortality showed latitude/environmental UV dependence and strong seasonality, with lower growth rates correlating to increased UV, unrelated to changes in temperature or humidity[1]. While infection risk was significantly higher in those with low serum vitamin D levels, oral supplementation with either cod liver oil or vitamin D had no effect on infection rates or disease severity[1]. A randomized, controlled, double-blinded pilot study of narrow-band UVB phototherapy for treatment of patients hospitalized with COVID-19 showed direct benefit, with a reduction in COVID-19 mortality[1].

The Case for Ophthalmological Sunlight Exposure

Perhaps one of the most striking examples of the benefits of sunlight comes from the field of ophthalmology. The incidence of myopia has increased dramatically worldwide, from 20-30% of East Asian children three generations ago to 80-90% today[1]. Myopia is strongly associated with reduced time spent outdoors, and clinical trial data show that increasing the time children spend outside reduces the risk of developing myopia and reduces the increase in refractive error[1].

The evidence is so compelling that the American Academy of Ophthalmology and the International Task Force on Myopia now recommend that children spend a minimum of 8-15 hours per week outside to reduce the risk of developing myopia[1]. This stands in stark contrast to dermatology advice in the UK that people avoid sunlight and seek shade between 11 AM and 3 PM[1].

Considering Skin Color in Sun Exposure Recommendations

Weller emphasizes that any advice on sun exposure must take skin color into account. Skin color determines biological response to UV and is central to any consideration of the risk-benefit ratio. There is no epidemiological evidence that UV-induced skin cancer occurs in black skin, yet UV-driven reductions in blood pressure and vitamin D synthesis are blunted in Black compared to White individuals[1].

The article cites the example of hypertension in different populations: Black Americans have a prevalence rate of hypertension 2.24 times as high as White Americans, yet West Africans have a prevalence of hypertension that is half that of Black Americans[1]. This suggests that the mismatch between skin color adapted to an ancestral UV environment and current residence may contribute to health disparities.

Recent Position Statements Supporting Reconsideration

Weller's conclusion is further supported by recent position statements from authoritative bodies. The United Nations Environmental Effects Assessment panel and an Australian panel endorsed by the Cancer Council of Australia and Australasian College of Dermatologists have both produced position statements recognizing that sunlight has beneficial effects that should be considered in formulating policy on sunlight exposure[1]. These statements also highlight the necessity of carrying out further research into these beneficial effects.

Conclusion

The comprehensive array of evidence presented by Weller—spanning epidemiology, clinical trials, evolutionary biology, and multiple medical specialties—provides robust justification for reconsidering our approach to sunlight exposure. The current dermatology-focused approach emphasizes skin risks without adequately accounting for systemic benefits that may outweigh these risks, particularly for certain populations and geographical locations.

The data strongly suggest that we need a more nuanced, personalized approach to sun exposure recommendations that considers variables such as skin color, geographical location, and seasonal variations. Further research into the vitamin D-independent mechanisms of sunlight's health benefits is warranted, as is greater cross-disciplinary collaboration between dermatologists and other medical specialists to develop holistic guidelines that optimize overall health outcomes.

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1. https://ppl-ai-file-upload.s3.amazonaws.com/web/direct-files/8349735/29f8f354-7c0d-4c08-aff3-4cf5924be7bb/Weller-Sunlight-time-for-a-rethink.pdf