

British Photodermatology Group Position Statement

Vitamin D

Background

Vitamin D is essential for musculoskeletal health. The sources of vitamin D are diet, and skin exposure to ultraviolet B in sunlight, with sunlight being a major source in most people.¹ However, ultraviolet radiation in sunlight is also the main external cause of both melanoma and keratinocyte cancers.^{2,3} Sunlight also causes photosensitivity disorders in susceptible people, and photoageing of the skin.

The sunlight exposure time to make significant vitamin D varies according to a number of environmental, physical and personal factors, but is typically short and less than the amount of time needed for skin to redden and burn.^{4,5} In fact, long exposures can break down vitamin D precursors and even vitamin D in the skin, potentially reducing benefit whilst increasing risk of skin cancer.¹

Apart from oily fish, natural foods contain little vitamin D, but it can also be obtained through fortified foods and vitamin D supplements, the latter being particularly needed in people at risk of low levels.⁶

Government publications have reported on sunlight exposure benefit and risks,⁷ the population target levels of vitamin D and how to achieve this through oral intake,⁶ and the relationship between sunlight exposure and vitamin D levels.¹ The British Photodermatology Group guidance takes account of these publications.

Recommendations

Vitamin D and health

- Everyone needs vitamin D, which is essential for good bone and muscle health. Low levels can cause the bone disorders of rickets and osteomalacia, and are associated with osteoporosis.^{6,8}
- Whilst there have been studies linking low vitamin D levels with a range of chronic conditions including cancer, heart disease, multiple sclerosis and diabetes, the evidence remains incomplete and it is concluded that currently no direct causal relationship has been shown.^{1,3,6} Vitamin D deficiency has been associated with worse outcomes in kidney transplants and in melanoma.^{9,10}

Vitamin D status and levels

- The body's vitamin D status is best reflected by the circulating level of 25,hydroxyvitamin D (25(OH)D).⁶
- Blood levels of 25(OH)D below 25 nmol/L (10ng/ml) are agreed to indicate "deficient" status and in the UK it is recommended to keep above this level throughout the year, i.e. in both summer and winter.⁶ The bone deficiency disorders of rickets and osteomalacia most frequently occur below this level.⁶

- Some authorities additionally state that a 25(OH)D level of 50 nmol/L (20ng/ml) represents a “sufficient” status, based on bone health findings, and recommend achieving this level.¹¹⁻¹³
- Levels of 25(OH)D greater than 125 nmol/L (50ng/ml) are not recommended, as adverse effects may occur.^{3,6}
- Unlike vitamin D production in the skin following sunlight exposure, which is biologically regulated, there is the potential that vitamin D gained from supplements and fortified foods could build up to levels that are too high.¹

Vitamin D from sunlight, and skin cancer considerations

- Sun exposure is a major source of vitamin D in the UK.^{1,5,14} However, it is also the main external cause of most skin cancers, which are very common and continue to rise in number in the UK.^{1,3,7,15}
- Sunbed use increases the risk of skin cancer, and is not recommended as a method for enhancing vitamin D status.^{15,16}
- Environmental factors (such as strength of sunlight in different times of day and season), physical factors (such as skin colour, age) and behavioural factors (such as type of clothing worn, time spent outdoors) influence risk and benefit of sunlight exposure.¹
- People with darker skin have much lower risk of skin cancer than people with lighter skin,^{15,17} but also produce less vitamin D on sunlight exposure.¹⁸⁻²⁰ However, balancing the risks and benefits of sunlight exposure is challenging, and more research is needed to address the uncertainties. NICE have concluded that sunlight exposure messages should be targeted differently for different population groups.⁷
- Casual short sun exposures, taking particular care not to burn (shown by skin reddening some hours after exposure) and avoiding deliberate tanning, can generate enough vitamin D to reach sufficiency status.^{4,5} This would equate to 10-15 minutes to head, arms and legs on most days of the week, in spring and summer around midday, in people with light skin. However, some skin DNA damage does occur in people with light skin even at these low doses, and hence caution is advised.^{19,21} People with darker (brown) skin would require longer exposures to generate similar rises in vitamin D levels, e.g. around 25 minutes on most days of the week.¹⁸

Vitamin D from dietary supplements

As an alternative to sunlight exposure, vitamin D can be gained through dietary supplementation.

- The UK Government recommends that everyone aged 4 years and above should consider taking a 10 microgram (400 iu) vitamin D supplement a day.²² They state that people who are not in groups at particular risk of low vitamin D (see below) may only

require vitamin D supplements in the winter, while those at particular risk of low vitamin D require vitamin D supplements all year round.

- Population groups at particular risk of low vitamin D include: pregnant and breastfeeding women, young children, older people, people with darker skin, those who wear whole body coverings or spend little time outdoors due to frailty or living in institutions.^{1,6} Children aged 1-4 years are recommended to take daily supplements of 10 micrograms daily, and slightly less, i.e. 8.5-10 micrograms, for children less than 1 year.
- Certain patient groups are also at particular risk of low vitamin D. This includes patients medically advised to minimise sunlight exposure, i.e. those with photosensitivity disorders/photodermatoses (conditions where the skin reacts abnormally to the sun), patients with skin cancer, and patients with increased risk of skin cancer including people who are immunosuppressed or genetically prone.¹ A blood test for vitamin D levels can assess the need for and response to supplements. People with certain medical conditions such as chronic kidney disease may require specialist input to manage their vitamin D levels.
- Vitamin D fortified foods such as fat spreads, and natural dietary sources particularly oily fish (including salmon, trout and sardines) can be useful for helping to maintain levels of vitamin D.⁶

References

1. Public Health England Advisory Group on Non-Ionising Radiation. Ultraviolet Radiation, Vitamin D and Health. 2017. <https://www.gov.uk/government/publications/ultraviolet-radiation-and-vitamin-d-the-effects-on-health>
2. International Agency for Research on Cancer. Vitamin D and Cancer 2008. IARC Working Group Reports vol. 5: World Health Organisation.
3. Neale RE, Lucas RM, Byrne SN, et al. The effects of exposure to solar radiation on human health. *Photochem Photobiol Sci*. 2023;22(5):1011-1047. doi:10.1007/s43630-023-00375-8
4. Rhodes LE, Webb AR, Fraser HI, et al. Recommended summer sunlight exposure levels can produce sufficient (≥ 20 ng/ml) but not the proposed optimal (≥ 32 ng/ml) 25(OH)D levels at UK latitudes. *J Invest Dermatol*. 2010;130(5):1411-8. doi:10.1038/jid.2009.417
5. Webb AR, Kift R, Durkin MT, et al. The role of sunlight exposure in determining the vitamin D status of the U.K. white adult population. *Br J Dermatol*. 2010;163(5):1050-5. doi:10.1111/j.1365-2133.2010.09975.x
6. Public Health England Scientific Advisory Committee on Nutrition. Vitamin D and health report. 2016. <https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report>
7. National Institute for Health and Care Excellence (NICE). Guideline NG34: Sunlight exposure: risks and benefits. 2016. <https://www.nice.org.uk/guidance/ng34>
8. Department of Health (Great Britain). Nutrition and bone health with particular reference to calcium and vitamin D: report of the Subgroup on Bone Health, Working Group on

the Nutritional Status of the Population of the Committee on Medical Aspects of Food and Nutrition Policy. London, United Kingdom: Stationery Office, 1998.

9. Koimtzis G, Stefanopoulos L, Brooker V, et al. The Role of Vitamin D in Kidney Transplantation Outcomes: A Systematic Review. *Life*. 2022;12(10). doi:10.3390/life12101664
10. Slominski RM, Kim TK, Janjetovic Z, et al. Malignant Melanoma: An Overview, New Perspectives, and Vitamin D Signaling. *Cancers*. 2024;16(12). doi:10.3390/cancers16122262
11. Institute of Medicine Committee to Review Dietary Reference Intakes for Vitamin D, Calcium. Dietary Reference Intakes for Calcium and Vitamin D. The National Academies Collection: Reports funded by National Institutes of Health (US). 2011.
12. European Food Safety Authority Panel on Dietetic Products, Nutrition and Allergies. Dietary reference values for vitamin D. *EFSA Journal*. 2016;14:e04547. doi:<https://doi.org/10.2903/j.efsa.2016.4547>
13. National Institute for Health and Care Excellence (NICE). Clinical knowledge summary: Vitamin D deficiency in adults. 2022. <https://cks.nice.org.uk/topics/vitamin-d-deficiency-in-adults/>
14. Macdonald HM, Mavroedi A, Fraser WD, et al. Sunlight and dietary contributions to the seasonal vitamin D status of cohorts of healthy postmenopausal women living at northerly latitudes: a major cause for concern? *Osteoporos Int*. 2011;22:2461-72. doi:10.1007/s00198-010-1467-z
15. Cancer Research UK. Updated 2023. <http://www.cancerresearchuk.org/> and <https://www.cancerresearchuk.org/about-cancer/causes-of-cancer/sun-uv-and-cancer/how-do-sunbeds-cause-skin-cancer>
16. International Agency for Research on Cancer Working Group on artificial ultraviolet (UV) light and skin cancer. The association of use of sunbeds with cutaneous malignant melanoma and other skin cancers: A systematic review. *Int J Cancer*. 2007;120:1116-22. doi:10.1002/ijc.22453
17. Agbai ON, Buster K, Sanchez M, et al. Skin cancer and photoprotection in people of color: a review and recommendations for physicians and the public. *J Am Acad Dermatol*. 2014;70:748-762. doi:10.1016/j.jaad.2013.11.038
18. Farrar MD, Webb AR, Kift R, et al. Efficacy of a dose range of simulated sunlight exposures in raising vitamin D status in South Asian adults: implications for targeted guidance on sun exposure. *Am J Clin Nutr*. 2013;97(6):1210-6. doi:10.3945/ajcn.112.052639
19. Felton SJ, Cooke MS, Kift R, et al. Concurrent beneficial (vitamin D production) and hazardous (cutaneous DNA damage) impact of repeated low-level summer sunlight exposures. *Br J Dermatol*. 2016;175:1320-1328. doi:10.1111/bjd.14863
20. Fajuyigbe D, Young AR. The impact of skin colour on human photobiological responses. *Pigment cell & melanoma research*. 2016;29:607-618. doi:10.1111/pcmr.12511
21. Shih BB, Farrar MD, Cooke MS, et al. Fractional Sunburn Threshold UVR Doses Generate Equivalent Vitamin D and DNA Damage in Skin Types I-VI but with Epidermal DNA Damage Gradient Correlated to Skin Darkness. *J Invest Dermatol*. 2018;138:2244-2252. doi:10.1016/j.jid.2018.04.015
22. Department of Health (Great Britain). Vitamin D. 2020. <https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-d/>