RISKS AND BENEFITS OF SUN EXPOSURE – IMPLICATIONS FOR PUBLIC HEALTH PRACTICE BASED ON THE AUSTRALIAN EXPERIENCE

Craig Sinclair | The Cancer Council Victoria
Email: Craig.Sinclair@cancervic.org.au

Abstract

Over recent years, the evidence has been accumulating that vitamin D has a positive impact on our health. This is likely to have an impact on the future of our public health advice related to skin cancer prevention. This paper explores, from a public health perspective based on Australian experience, how skin cancer prevention messages need to be managed in light of new information about vitamin D and in particular, the times when sun protection advice should be provided. Conclusions are drawn in relation to how the vitamin D message can be complementary to the sun protection message.

Exposure to ultraviolet radiation accounts for around 99% of non-melanoma skin cancers and 95% of melanomas in Australia.1 On the other hand, there is very good evidence that exposure to sunlight enhances vitamin D levels that can have an impact on improving bone and musculoskeletal health for older people who are vitamin D deficient.2,3 This paradox creates a significant challenge for those working in public health to ensure an appropriate balance is communicated to the general public that takes into account the risks and benefits of sun exposure.

With Australia having one of the highest rates of skin cancer in the world, prevention campaigns have been part of the Australian public health landscape since the early 1980s. Slogans such as Slip! Slop! Slap! and SunSmart have a very high public profile and there is considerable policy and practice in place that reinforces sun protective behaviour.4

The Cancer Council Victoria has the longest standing and best evaluated program in Australia, where there has been population monitoring of sun protective behaviour and attitudes since 1987. Over this time there has been a significant reduction in the desire to tan, improved use of sun protective items such as hats and sunscreen and a significant reduction in sunburn rates.5,6 The benefit of these campaigns has been a reduction in non-melanoma skin cancer rates in younger age groups.7

The improvement in sun protection policies and practices has come about largely because of a long standing integrated health promotion intervention that utilises mass media as the primary method to communicate to the general population, combined with community based interventions. Given this success, it is not too surprising that the media have been very responsive to research reports that highlight the benefits of vitamin D that may run counter to well established skin cancer prevention messages.

Vitamin D deficiency

In recent years, research has identified findings that were showing high levels of mild vitamin D deficiency (between 25 to 50 nmol/L) in the general populations in the southern states of Australia over winter months. Any levels less than 50 nmol/L can lead to increased parathyroid hormone secretion and high bone turnover.8 In a Geelong (Victoria 37°S) study by Pascoe et al it was shown that 43% of females over the winter months were mildly vitamin D deficient and 8% of 20-59 year old women were regarded as moderately to severely vitamin D deficient (less than 25 nmol/L).9 In addition to this, 80% of dark skinned veiled women were noted as being vitamin D deficient. Older people who are institutionalised or housebound are also at a particularly high risk of vitamin D deficiency.10,11 Vitamin D deficiency is not just confined to adults. In a Tasmanian study, it was found that 10% of healthy eight-year-olds (mean age) were found to be mildly deficient during the winter months.12

Vitamin D production decreases during winter when the intensity of ultraviolet (UV) radiation is lower. The body can rely on tissue stores of vitamin D for between 30 and 60 days assuming vitamin D levels are adequate prior to winter.13 In most cases, any vitamin D reduction during winter is corrected in summer when more sunlight is received with more time spent outdoors. While this correction may occur, it is still important to prevent deficiency during winter as fracture rates increase with deficiency, particularly with older adults.
In 2004, Osteoporosis Australia raised concerns in the media about vitamin D deficiency at the same time that new research by Hughes A-M et al was coming out about possible benefits of sun exposure in reducing non-Hodgkin’s lymphoma. Given the significant media attention centre around possible or real benefits of sun exposure, The Cancer Council Victoria considered it was necessary to develop a position statement with the Australasian College of Dermatologists (ACOD), Osteoporosis Australia (OA), Australia and New Zealand Bone and Mineral Society (ANZBMS) and The Cancer Council Australia to ensure consistent information was being provided to the general public.

On 15 July 2004, The Cancer Council Victoria and the National Cancer Control Initiative hosted an expert meeting with representatives from relevant disciplines to investigate whether there was a basis for a common understanding relating to the risks and benefits of sun exposure. A report from that meeting was published, along with a number of key recommendations that had unanimous support from all parties. In addition to this, following the meeting a position statement was approved and released in March 2005 that had the approval of the ACOD, OA, ANZBMS and The Cancer Council Australia. The process of reaching agreement with each of the parties was critical in ensuring consistency in the messages being delivered to the media around the vitamin D issue and to provide confidence to the general community that there was consistent health advice from each of the key agencies.

The position statement resulted in a number of key outcomes directly related to skin cancer control. Essentially it was agreed:

- A balance is required between avoiding increases in skin cancer and maintaining adequate vitamin D levels.
- Sun protection messages needed to shift away from the notion that people have to protect themselves against the sun at all times.
- Skin cancer campaigns need to note that there are benefits and harms associated with sun exposure and that a balance between the two needs to be achieved. This had not been a general perspective of skin cancer prevention messages to date.
- Sun protection messages should refrain from encouraging people to stay indoors; instead they should be about encouraging people to take the right precautions when they are outside.
- Sun protection should only be applicable when the UV index is three or above.

**The relationship between sun exposure and other diseases**

There is in Australia unanimous agreement by the ACOD, OA, ANZBMS and The Cancer Council Australia that there is high-level evidence for the harmful effects of sun exposure in terms of skin cancer and for the beneficial effects of sun exposure in maintaining adequate vitamin D levels to protect against osteoporosis and bone fracture. However all parties agree that substantially more evidence is required before conclusions can be drawn between sun exposure and a possible beneficial effect with other cancers such as breast, prostate, bowel, or non-Hodgkin’s lymphoma and auto-immune diseases such as multiple sclerosis. The biological pathways underlying these empirically observed observations are still not clear and in some instances the epidemiological evidence is equivocal. It was agreed by all parties that it was not appropriate to make statements about a protective effect of UV radiation exposure for these diseases because substantially more studies with good individual exposure measures by season are required.

**How much sun exposure is enough?**

The most difficult factor in coming to an agreed position statement has been to determine what would be a reasonable level of sun exposure necessary for healthy bone growth and development that will not add to a substantial risk of skin cancer. It was clear amongst OA, ANZBMS and the ACOD that we are still a long way from having sufficient evidence to suggest where this point should be exactly. This difficulty exists almost entirely due to the limitation and paucity of existing research. This issue is also compounded because skin type, age and culturally related clothing practices vary the ability to absorb vitamin D through UV exposure.

Recognising the limitations of existing evidence, a very pragmatic approach was adopted in Australia. Based on evidence relating to osteoporosis and vitamin D, it was agreed one third of an MED to 15% of the body, (eg. the face, arms and hands) on most days of the week was acceptable to maintain adequate vitamin D absorption to reduce osteoporosis risk. In practice this equates in the Australian context to only 10 minless sun exposure either side of the peak UV period on most days of the week and two to three hours per week sun exposure during the winter months. This level was acceptable to the ACOD as it was considered that the general population were already likely to be exceeding these recommendations as part of their normal day-to-day activity, even if they were always adopting sun protective measures during periods of high UV radiation. In addition, all parties agreed that the benefit of some sunlight is far greater for general good health than it is detrimental for skin cancer.

Therefore there is no recommendation that people should deliberately expose themselves to the sun to enhance their vitamin D levels. The only exceptions are those people who are at high risk of being vitamin D deficient and when controlled sun exposure outside the peak UV periods may be beneficial to their health if supplementation is not available.
Times of the year and times of the day when sun protection should be applied

The Global UV Index released by the World Health Organization (WHO) in 2002 is a very useful tool to determine when sun protection is required and equally when it is not necessary. According to the Global UV Index that is now the international standard for UV measurement, sun protection should be promoted when the UV Index is three or above.

Figure 1 provides an example of the appropriate times of the year when we should be communicating the sun protection message. For example, Melbourne (Australia 38°S) shows that between the winter months of May and August inclusive, it is unlikely that sun protection will be necessary unless people will be near highly reflective surfaces such as snow and water, or at high altitudes. In the northern hemisphere over the summer months, it shows that the appropriate time for Leeds, UK at 54°N would be that sun protection advice should be reinforced between the months of May and August inclusive. For Glasgow, Scotland at 56°N it would be for a similar duration. Toronto, Canada at 43°N, sun protection campaigns would be appropriate for at least between March and October inclusive.

The UV Index can also be a useful tool to determine what time of the day that sun protection is required. In Australia, the Bureau of Meteorology in conjunction with The Cancer Council have been illustrating for the first time the UV Index in terms of a peak value for the day, as well as the times of day when sun protection is required (see Figure 2). This provides very useful information for the general public to guide their behaviour.

People with dark skin who wear veils, particularly in pregnancy, elderly or infirm people, those with malabsorption syndromes, organ transplant patients and those with personal risk factors of skin cancer will require a tailored health management plan that is likely to include vitamin D supplementation.

Figure 1
Average UV levels per month by city

Is increased physical activity a key part of the solution?

Of significant note is that mildly deficient vitamin D levels (between 25 to 50 nmol/L) in the general population have been only during winter periods. Notably, children who were obese had lower vitamin D levels and higher levels of vitamin D were seen in adolescent boys who participated in sport. Therefore, by encouraging people to be more physically active outdoors in winter months, we will not only be increasing their vitamin D levels, but also importantly contributing to their overall good health. Increasing levels of physical activity will not be a solution however at latitudes where no UV is present over winter months.

Vitamin D deficiency and sun protection, are the messages complementary?

Vitamin D deficiency in the Australian context in the general population is largely confined to winter months in southern states when the sun protection message is not a relevant public health message. When the Global UV Index is in the moderate to extreme range, undertaking sun protection measures such as regular sunscreen application is unlikely to increase osteoporosis risk. A study by Matsouka et al. (Figure 3) showed that while sunscreen use initially reduced vitamin D absorption, this effect was dissipated after seven days.

Conclusion

With appropriate refinements of the sun protection message, sun protection programs do not have to compete with the human need for vitamin D; the two messages can be quite complementary. In terms of key recommendations going forward, every opportunity should be made to promote the Global UV Index to those responsible for delivering sun protection campaigns, to guide when sun protective behaviour

Circulating concentrations of vitamin D after a single exposure to one minimal erythemal dose of simulated sunlight either with a sunscreen, with a sun protection factor of 8, or a topical placebo cream.

Matsouka et al; J Clin Endocrinol Metab, 1987 et al; J Clin Endocrinol
should be encouraged as well as when it may not be required. In terms of public health, we must continue to raise public awareness of potential negative health effects from excessive sun exposure during periods when UV is in the moderate to extreme range. In periods when the UV level is low (<3), it will be important to not encourage sun protective behaviour, except near highly reflective surfaces or high altitudes. In high latitude countries with very low UV levels for a significant proportion of the year, the increased use of vitamin D fortification in food and supplementation for high risk individuals should be considered.

Further research is required to understand the relationship between vitamin D and risk of cancer and autoimmune diseases, and to determine how much sun exposure is necessary to achieve adequate vitamin D levels. This information will help determine the right balance between the need for vitamin D versus the known benefits of sun protection.

References


