Fig 1. Recommended sun protection scheme. If sun protection is required (UV index [UVI] of 3 and above), this should include all protective means, eg, clothing, sunglasses, shade, and sunscreen. Below UVI of 3, radiation damage is limited and no protective measures are needed–even for very sensitive fair-skinned people. Adapted.[5]

from 1 to 11+ and are grouped into low, moderate, high, very high, and extreme exposure categories with corresponding color codes and pictograms, indicating recommended sun protection strategies (Fig 1). Easy-to-understand information on the global solar UVI and recommended sun protection measures are available from the WHO World Wide Web page (www.who.int/uv). The WHO encourages the medical community to promote the global solar UVI, use it as an education tool, and to reinforce recommendations for proper sun protection to the patient at risk. A simple brochure,[5] available in dermatology offices, summarizing basic facts and protection measures will go a long way in reducing the skin cancer epidemic and other UV-related illnesses.

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Protecting against adverse effects of sun protection

To the Editor: Exposure to ultraviolet (UV) light is the main cause for the development of nonmelanoma skin cancer. In addition, assessment of sun-exposure parameters has consistently shown an association between the development of malignant melanoma and short-term intense UV exposure, particularly burning in childhood.[1] Therefore, promoting sunscreen use is an integral part of prevention programs aimed at reducing UV radiation–induced skin damage and skin cancer. Most sunscreens combine chemical UV-absorbing sunscreens and physical inorganic sunscreens, which act mostly by reflecting UV, to provide broad-spectrum protection. By contrast, 90% of all requisite vitamin D is formed within the skin through the action of the sun; this is a serious problem in that a connection between vitamin D deficiency and various types of cancer (eg, colon, prostate, and breast) has been suggested in a large number of studies.[2-5] As a consequence, this association between vitamin D deficiency and various internal malignancies has now opened a debate among dermatologists as to whether sun-protection measures to prevent skin cancer should be moderated.

What is the rationale that vitamin D deficiency may be associated with an increased risk of certain types of cancer? A negative association between increased risk of dying of various internal malignancies (eg, breast, colon, prostate, and ovarian cancer) and decreasing latitude toward the equator has been reported.[5] In addition, a correlation of this latitudinal association with decreased vitamin D serum levels has been shown.[3] Black men, who have an increased risk of vitamin D deficiency development, also have an increased risk of prostate cancer and a more aggressive form of the disease develops. The evolution of our understanding of the role of vitamin D in cancer parallels our understanding of the role of vitamin D in rickets. In both diseases, epidemiologic observations about sun exposure preceded experimental observations and were subsequently validated by them. It has now been demonstrated that in contrast to earlier assumptions, skin, prostate, colon, breast, and many other tissues express the enzyme to convert 25(OH)D to its active form, $1,25(OH)_2D$.[6-8] Therefore, $1,25(OH)_2D$ is now not exclusively considered as a calciotropic hormone

but also as a locally produced potent hormone regulating cell growth.[7] In consequence, a number of recently published studies point at a protective effect of locally produced vitamin D in the pathogenesis of various malignancies.[8] Interestingly, new findings demonstrate a contribution of the skin vitamin D system to the pathogenesis of malignant melanoma.[8] In contrast to the internal cancers discussed above, many studies have shown that the incidence of malignant melanoma increases with decreasing latitude toward the equator.[9] However, in contrast to short-term intense exposure, more chronic and less intense exposure has not been found to be a risk factor for the development of malignant melanoma and, in fact, has been found in some studies to be protective.[10] It has been speculated that these connections may be an explanation for the finding of an increased risk for development of melanoma after sunscreen use that was reported recently.[11] However, one has to keep in mind that an extensive recent analysis of this topic, on the basis of analysis of all 14 studies published thus far, could not confirm an increased risk for melanoma developing after sunscreen use.[12]

What conclusions do we draw from these findings, most importantly the demonstration of an association between vitamin D deficiency and the occurrence of various types of cancer? The most important take-home message, especially for dermatologists, is that strict sun-protection procedures to prevent skin cancer may induce the health risk of vitamin D deficiency. There is no doubt that UV radiation is mutagenic and is the main reason for the development of nonmelanoma skin cancer. Therefore, excessive sun exposure has to be avoided, particularly burning in childhood. To reach this goal, the use of sunscreens and the wearing of protective clothes and glasses are absolutely important. In addition, sun exposure around midday should be avoided during the summer in most latitudes. However, the dermatologic community has to recognize that there is evidence that the protective effect of less intense solar radiation outweighs its mutagenic effect. In consequence, cancer mortality could be reduced through careful exposure to sunlight or, more safely, vitamin D supplementation, especially in nonsummer months. Therefore, recommendations of dermatologists on sun protection should be moderated. As Holick[13] reported previously, we have learned that at most latitudes, such as Boston, Mass, very short and limited solar exposure is sufficient to achieve adequate vitamin D levels. Exposure of the body in a bathing suit to 1 minimal erythemal dose of sunlight is equivalent to ingesting about 10,000 IU of vitamin D and it has been reported that exposure of less than 18% of the body surface (hands, arms, and face) 2 to 3 times a week to between one third and one half of a minimal erythemal dose (about 5 minutes for adults with type-II skin in Boston, Mass, at noon in July) in the spring, summer, and autumn is more than adequate.[12] Anyone intending to stay exposed to sunlight longer than recommended above should apply a sunscreen with a sufficient sun-protection factor to prevent sunburn and the damaging effects of excessive sun exposure. Although further work is necessary to define the influence of vitamin D deficiency on the occurrence of melanoma and nonmelanoma skin cancer, it is currently mandatory that clinicians, especially dermatologists, strengthen the importance of an adequate vitamin D status if sun exposure is seriously curtailed. It has to be emphasized that for groups that are at high risk of vitamin D deficiency developing (eg, nursing home residents; patients with skin type I, or patients under immunosuppressive therapy who must be protected from sun exposure), vitamin D status should be monitored. Vitamin D deficiency should be treated, eg, by giving vitamin D orally as recommended previously.[13] It has been shown that a single dose of 50,000 IU of vitamin D once a week for 8 weeks is efficient and safe to treat vitamin D deficiency.[14] Another means of guaranteeing vitamin D sufficiency, especially in nursing home residents, is to give 50,000 IU of vitamin D once a month. An alternative to prevent vitamin D deficiency would be the use of vitamin D–containing ointments. However, it should be noted that vitamin D–containing ointments are, at least in Europe, not allowed as cosmetics. These antiquated laws are the result of the fear of vitamin D intoxication that was evident in Europe in the 1950s[15] and should be reevaluated, for they do not reflect our current scientific knowledge. If we follow the guidelines discussed above carefully, they will ensure an adequate vitamin D status, thereby protecting us against adverse effects of sun protection. Most importantly, these measures will protect us sufficiently against the influence of vitamin D deficiency on the occurrence of various malignancies without increasing our risk of UV-induced skin cancer development. To reach this goal it is of high importance that this information is transferred to every clinician, especially to dermatologists.

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