This year, more than one million new cases of skin cancer will be diagnosed in the United States and an estimated 9800 individuals will die of the disease. Despite recent public education efforts and increased public awareness about the importance of the use of sunscreen and avoidance of ultraviolet radiation, the incidence of melanoma has more than tripled among white Americans from 1980 to 2001. This increase in cancer rates means that one person dies of melanoma in this country every hour of every day.

The answer to this increasing problem is not a simple one, but public education seems to be a common starting point. The American Cancer Society and the American Academy of Dermatology have published recommendations with regard to sun exposure and sunscreen use. However, patients often ask questions that are not as easily answered. Questions such as, Which sunscreens are the safest? Are tanning beds safe? If I limit my sun exposure, do I need to take vitamin D supplements? If I tanned as a teenager, is the damage already done? How do I treat sunburn? This article provides a review of the current literature regarding these issues and provides the facts family physicians need to answer common patient questions.

The author discusses the mechanisms of sun damage, the facts on tanning beds, and the importance of supplementing vitamin D.

Half of all newly diagnosed cancers are skin cancers. Ultraviolet irradiation is the predominant risk factor for the development of both melanoma and nonmelanoma skin cancers.

Although most patients are aware that ultraviolet (UV) exposure includes exposure to sunlight, they may not be aware that they are exposed to ultraviolet light when using tanning beds, when working with UV lamps, and when receiving therapeutic exposure in the treatment of some skin disorders. The American Cancer Society, the American Academy of Dermatology, the US Department of Health and Human Services, and the US Environmental Protection Agency all have similar recommendations regarding sun exposure: wear protective clothing, apply sunscreen with a sun protection factor (SPF) of at least 15 and avoid UV exposure between the peak exposure hours of 10 AM and 3 PM. The American Academy of Dermatology has specific recommendations on sunscreen use as noted in Figure 1.

Children and Skin Types

When discussing skin types, most clinicians use the Fitzpatrick phototype scale, with ratings from I to IV (I: never tans/always burns, II: sometimes tans/ususally burns, III: usually tans/sometimes burns, IV: always tans/rarely burns). People with fair skin and light hair have an increased risk of developing both cutaneous malignant melanoma and basal cell carcinoma. Current literature indicates that an individual’s exposure during childhood is a strong determinant of melanoma risk. Gallagher et al note that people who lived in a sunny environment for more than 1 year before the age of 10 had a fourfold increase in the risk of melanoma. In addition, people born in California have higher rates of melanoma than other Americans, irrespective of their current place of residence.

Melanocytic nevi originate in childhood and are caused by sun exposure. These acquired nevi increase the risk for the development of cutaneous malignant melanoma. In case-control studies, there is an inverse relationship with children who used broad-spectrum sunscreen and the development of new melanocytic nevi. Children whose parents required them to wear sunscreen were more apt to use sunscreen as adults, which further protects them from the development of skin cancer. Specific sunscreens have been designed and are marketed for use in children.

Sunburn

Driscoll and Wagner note, “A sunburn is a chemical response to acute cutaneous solar photodamage due to excessive UV light exposure.” The principal cause of a sunburn is ultraviolet irradiation at wavelengths between 320 nm and 290 nm (UVB). Histologically, upon examination of sun-damaged skin, physicians will observe dyskeratotic and vacuolated keratinocytes known as sunburn cells. There is also a reduc-
tion in the number of Langerhans cells and a general immuno-suppressive effect, which is believed to contribute to the photocarcinogenic process. The application of commercially available sunscreen products will reduce the acute affects of UV irradiation, including the appearance of sunburn cells, the migration of the Langerhans cells out of the epidermis, as well as the inflammatory response. The regular use of sunscreen has been found to decrease the number of actinic keratoses and nonmelanoma skin cancers.5

The treatment of acute sunburn is a common dilemma faced by numerous physicians each summer. Clinical evidence has shown that nonsteroidal anti-inflammatory drugs, steroids, and antihistamines have little effect on the erythema caused by these burns. Furthermore, the topical anesthetics containing benzocaine carry a significant risk of allergic contact dermatitis and are presently not recommended for treatment.12 Pain control and future sunburn prevention are the two things that physicians can offer patients after they have been sunburned.

### Sunscreen

According to the Centers for Disease Control and Prevention, 70% of adults in the United States do not protect themselves from sun exposure.13 Even patients who have had skin cancer previously diagnosed do not change their habits with regards to the sun. In a study that followed up patients who had been treated for basal cell carcinoma 1 year after surgical intervention, 15% did not wear any sunscreen and 42% did not know what the abbreviation SPF stood for.14 The responsibility for these lapses rests on any physicians who failed to properly educate patients when the skin lesion was removed.

High rates of skin cancer have been diagnosed among occupational groups who work outdoors. In a recent survey of California construction and highway workers, only 51% had received any skin cancer education.1 Furthermore, only 30% wore sunscreen on the day of the survey.1 The US Department of Labor’s Occupational Safety and Health Administration does not require skin education of these employees who are exposed to UV radiation for up to 12 hours each day.
Physicians need to include questions in their history taking that screen patients for high exposure to UV radiation. We should also encourage patients with a high level of risk to wear protective clothing and use sunscreens. It is believed that the higher the SPF grading, the more effective protection the product provides against skin cancer. However, commercial brands of sunscreen differ in their active ingredients. In a study that examined the absorption of these ingredients across the skin, one ingredient, benzophenone-3, generated concern. The study’s authors noted that this ingredient “demonstrated sufficiently high penetration to warrant further investigation of its continued application.” All other ingredients tested showed limited absorption. Most of the active ingredients available in sunscreens and their spectrum of coverage are illustrated in the Table.

There also has been research looking at other topical and systemic agents for use in protection from solar damage. The most promising to date is the polyphenolic extract from green tea. These extracts have been shown to be effective chemoprotective agents against the effects of UV damage including reducing the number of sunburn cells, reducing the DNA damage from UV irradiation, and protecting the Langerhans cells. Green tea extracts do not work in the same manner as sunscreen by blocking UV light, but rather on a cellular level. Animal models have even demonstrated that if this extract is added to the water supply, there is cellular evidence of photoprotection.

Wound Healing

Scientists have demonstrated that skin cancer can occur in damaged tissue due to burns (ie, Marjolin’s ulcer). Physicians need to emphasize the need to protect iatrogenically damaged tissue as well, specifically any type of surgical site. Numerous studies demonstrate the ill effects of UV irradiation preoperatively and postoperatively from laser surgery. It is easy to see the increased complications of hyperpigmentation and prolonged inflammation. There is further evidence that any postoperative UV exposure will disrupt the healing process, “aggravat[ing] bulging, infiltration, fibrosis, and hyperpigmentation, thus confirming the necessity of avoiding sun exposure by blocking UV light, but rather on a cellular level. Animal models have even demonstrated that if this extract is added to the water supply, there is cellular evidence of photoprotection.

Tanning Beds

On an average day in the United States, more than one million people spend time in a tanning salon. This is a $2 billion industry, but only 21 states have regulations in place. As of yet, the tanning industry has no legal responsibility to provide data on the carcinogenic effects of tanning to its customers. The average tanning bulb emits 95% UVA radiation and 5% UVB radiation. UVA irradiation can cause a sunburn and has been implicated in both photoaging and nonmelanoma skin cancers. In fact, an estimated 700 emergency department visits per year are related to the use of tanning beds. In the face of these facts, the industry maintains that this activity is safe and, in some cases, even healthy.

There is an increasing awareness that UVA (400 nm – 320 nm) can also be damaging to the skin. Similar to outdoor exposure, recreational tanning will cause molecular alterations that are believed to be essential in the development of skin cancer. Specifically, DNA alterations and P53 protein expression occur. Short-term use of tanning beds can cause long-term skin damage and increase the chances of skin cancer.

Vitamin D

The question arises about protecting people from the sun and vitamin D deficiency. This is a valid concern considering that vitamin D deficiency has become an epidemic in adults older than 50 years. Vitamin D deficiency increases the risk of bone disease, muscle weakness, and possibly certain types of cancer. Some literature suggests that vitamin D deficiency increases the risk of diabetes mellitus, hypertension,
myocardial infarction, and susceptibility to tuberculosis. Vitamin D is directly involved in preserving serum calcium levels through increased intestinal absorption, which has been proven to decrease the risk of colon cancer. Vitamin D is not really a vitamin, but a prohormone that is either consumed orally or produced photochemically in the skin from 7–dehydrocholesterol. This previtamin is then converted to the active hormone via the liver and kidney.

Sunlight exposure is considered the most important source of vitamin D for humans, though the ability to produce vitamin D from sunlight exposure decreases with age because of decreased levels of 7–dehydrocholesterol in the skin. Individuals consume few foods that are naturally high in vitamin D in a normal diet. Cod liver oil, oily fish, and fortified milk have vitamin D. Several large prospective studies have shown that vitamin D deficiency does not result from regular sunscreen use. However, most authors of recent literature on this subject feel the need to increase the daily recommended dose of vitamin D, whether one is protecting oneself from sun exposure or not. In 1997, the Institute of Medicine of the National Academies increased the recommended intake of vitamin D to 200 IU/d for individuals younger than 50 years, 400 IU/d for those 50 to 70 years, and 600 IU/d for people older than 70 years. Many investigators have recommended 1000 IU/d when the patient is avoiding sun exposure. There is no consensus on what level of vitamin D intake is optimal or safe. The published cases of vitamin D toxicity with hypercalcemia for which the 25–hydroxyvitamin D and vitamin D doses were known, all involved intake of 40,000 IU/d. If the objective is to optimize an individual’s health, it seems reasonable to recommend a daily dose of 800 IU/d to 1000 IU/d.

Epidemiologic studies have shown a lower rate of breast cancer and prostate and colorectal carcinomas with higher serum concentrations of 25–hydroxyvitamin D, and further research is presently ongoing. Individuals with high serum concentrations of 25–hydroxyvitamin D have been shown to have a threefold decrease in colon cancer. Currently, a large-scale prospective clinical trial, the Women’s Health Initiative, is attempting to prove by 2007 the validity of supplementing vitamin D to lower the risk of breast and colon cancer.

Comment

Patient histories and physical examinations need to include the use of tanning beds and sun bathing, as well as work environments. Physicians need to ask patients if they use sunscreen, how often, how much, and what SPF. Parents should be encouraged to apply sunscreen to their children before going outdoors to play, limit the time they spend outside during midday hours, and require the use of hats and sunglasses.

Patients can be assured the use of sunscreen will not cause vitamin D deficiency, and that vitamin D supplementation is not only safe, it is also recommended for its health benefits and potential for cancer protection. Currently, physicians should be following the age-dependent dosing set forth by the Institute of Medicine of The National Academies with the understanding that these guidelines are under review.

We can decrease the number of patients with skin cancer by increasing patient education on sun exposure. People need to be reminded to use sunscreens and wear protective clothing year-round, not just when they are headed to the beach. Most new cases of skin cancer are preventable and, with increased physician involvement, we can lower the number of deaths due to skin cancer each year.

References


