Sun Protection: What We and Our Patients Need to Know

To preserve their health and the appearance of their skin, patients need straightforward, practical advice on susncreen selection and protection strategies.

By Jonathan Wolfe, MD

From preventing skin cancer to preserving a youthful appearance, sunscreens play an important role in dermatologic care. However, some confusion persists among patients and even some practitioners when it comes to SPF, available chemical and physical sunscreens, and the best advice for sun avoidance. In recognition of the AAD's Skin Cancer Detection and Prevention Month, I'll review important patient education points.

Understanding SPF

The non-scientific explanation of radiation is that UVA contributes significantly to aging while UVB is responsible for burns. Scientific evidence supports these observations but shows the reality is far more complex. UVB levels, which are relatively low compared to UVA, penetrate the superficial epidermal layers, where the absorbed energy produces erythema and can induce cellular damage that may lead to skin cancer formation.[1,2] UVA radiation penetrates more deeply, through most clothing and into the epidermis and dermis. UVA has long been associated with melanoma risk[4] (the mechanism remains unclear), and recent research suggests that it also plays a role in the development of squamous cell and basal call carcinomas.[3] In addition to causing direct damage to cells, UVA radiation is linked to free-radical generation.

While both UVA and UVB radiation are associated with skin cancer risk, the sun protection factor or SPF scale used to rate sunscreen formulations only measures protection against cutaneous burning—the effects of UVB—and does not account for UVA radiation at all.[5] As a result, a product with a high SPF could actually confer little or no protection against UVA.

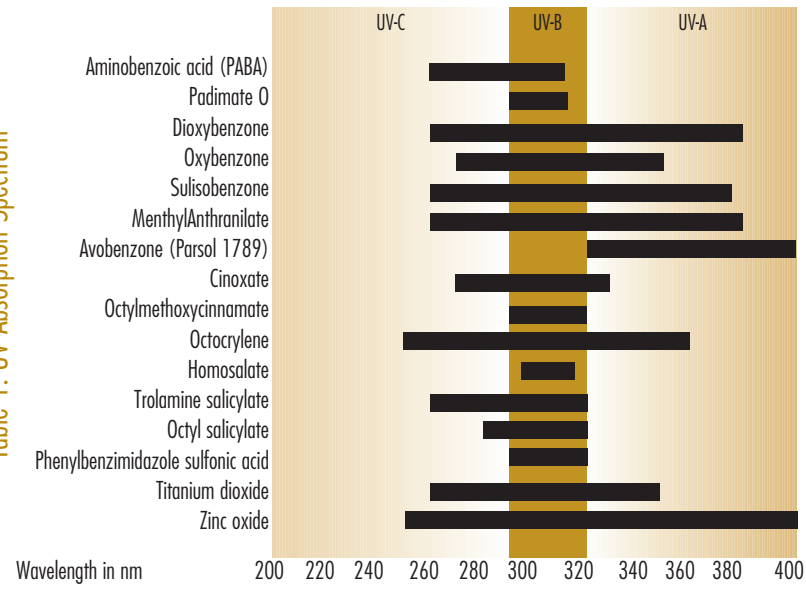
The somewhat esoteric description of SPF calculation is available online at the FDA website.[6] Ultimately, the SPF number represents the ratio of the MED for protected skin (MED(PS)) to the MED for unprotected skin (MED(US)). Tests are conducted only in patients with skin types I-III, and the applied MED(PS) ranges from 0.64 to 1.56 times the MED(US) depending on skin type.

A common belief among patients is that the SPF number reflects a time factor—the higher the number the more time one can spend outdoors without burning. Even a FDA public education piece states, "A higher number means it protects longer."[7] This is not a strictly accurate interpretation of the SPF value and ignores the fact that unique properties of the main sunscreen ingredients (chemical or physical) and the formulation (waterproof, water resistant) influence duration of protection.

Patients also often falsely assume that the increase in SPF value is proportionate to the increase in UVB protection. It is not. A product with SPF 30 does not block twice the amount of UVB as a product with SPF 15. In actuality, an SPF 30 product may filter out less than 97 percent of UVB, while SPF 15 may filter out more than 93 percent.

Because SPF value only addresses the UVB protection a product confers, der-

Table 1. UV Absorption Spectrum



Adapted from www.solumedia.com/sunscreen3.htm

matologists now recommend that patients look for and use only "broad-spectrum" sunscreen products. To help patients make wise product choices, we must explain SPF to them and offer some advice on identifying and choosing the most effective ingredients.

Physical and Chemical Blocks

The ingredient with the widest protective absorption spectrum available in the US is micronized zinc oxide (ZnO) or Z-Cote, which offers absorption from about 250nm to 400nm. As a physical sunscreen, ZnO sits on the skin to create a reflective barrier against UVR, whereas chemical sunscreens absorb into the skin. At concentrations of 3.5% or more, micronized ZnO confers good broad-spectrum protection. Nonetheless, it is often formulated with other physical and chemical sunscreens to enhance protection. Zinc oxide is very water resistant.

Like zinc oxide, titanium dioxide (TiO_2) is also a broad-spectrum physical sunscreen, but its absorption spectrum (260-360nm) does not extend as far into the UVA range. Even as a microfine particle, TiO_2 may produce a whitish residue when applied to the skin.

Parsol 1789 or avobenzone is another popular sunscreen ingredient. This chemical sunscreen absorbs across the full UVA spectrum but confers no UVB protection. It must be combined with UVB blocking ingredients to confer full-spectrum UVR protection. There's controversy regarding the photostability of avobenzone with some reports (but no accessible published studies) suggesting that the agent degrades upon exposure to UVR. A 1996 study in *Journal of Chromatography BioMedical Applications* reportedly showed that the concentration of avobenzone in a sample decreased by just 25 percent following 72 hours of sun exposure.

Oxybenzone is another UVA screen, though its absorption range is relatively narrow. Octyl methoxycinnamate is probably the most commonly used chemical for UVB protection. Table 1 lists UV protective absorption spectrums of most approved sunscreen ingredients.

Some confusion exists regarding water resistance of sunscreen products. The label SPF of a "water resistant" product is the SPF calculated after application and subsequent exposure to water for 40 minutes. The label SPF of a "very water resistant" product is the SPF after 80 minutes. Note that in both assays, subjects air dry after emerging from the water but before enduring UV irradiation; they do not towel off. In reality, patients who towel off theoretically remove at least some sunscreen product.

Beyond Sunscreens

Beyond helping patients decide which sunscreens to use, offer directions on how to properly use it. Stress the need to apply sunscreen 15 minutes before exposure to sunlight and the need to apply it to all sun exposed skin. Patients easily forget the hands, ears, back of the neck, and the feet. Estimates suggest that patients generally apply about one third the recommended amount of sunscreen to their skin ($2mg/cm^2$ of skin surface area).

As we continue to stress sunscreen use, we must also offer patients practical advice about sun avoidance and sun-protection tactics. Patients should avoid direct sunlight as much as possible, especially during midday, and should not use UV tanning lamps and beds. There's a persistent myth, promulgated to some extent by the tanning salon industry, that a "base tan" can be protective. Tell patients this is false.

Apparel, including broad-brimmed hats and scarves, can be protective, but patients may not realize that UVR, particularly UVA, can penetrate many fabrics, particularly cotton weaves and wet clothing. Specially-woven and treated fabrics that reflect both UVA and UVB radiation are used to make swimsuits, every-day clothing, and hats. Many brands and styles are available, many over the Internet. An Australian study is underway to assess the benefit of such clothing. There is even a laundry additive (Sun Guard) that increases the UV blocking ability of clothes. Some beach umbrellas may permit a fair amount of UVR to pass through. Patients can purchase umbrellas and canopies made from UVR-reflecting materials.

Finally, when asking patients to abandon a bad habit, such as tanning, it helps to offer alternatives. UV-free tanning with DHA sprays and lotions is a safe alternative that may be worth considering.[9] A recent study revealed that college students who received education about photoaging, UV photographs, and access to sunless tanning engaged in greater sun protection behaviors than controls or those who received education and photography alone.[10]

A Skin Wellness Program

Depending on your particular patient base or practice focus, you may encounter individuals who are as interested in reversing already apparent photo-damage as they are in preventing additional injury. Be receptive to patients' skin care concerns when discussing sunscreens.

For patients with mild to moderate photodamage, topical retinoids are an obvious choice for inclusion in the regular skincare regimen. Beyond their role in diminishing fine lines and wrinkles and evening skin tone, topical retinoids influence cell differentiation and can block proliferation of malignant cells.

For patients with very mild signs of photodamage, a cosmeceutical product may be appropriate based on your assessment of the product and its efficacy. Note that there's continuing research into the incorporation of topical antioxidants within sunscreens to offer protection and reversal of oxidative stress. However, there's no evidence that any available product formulated with antioxidants confers additional benefit over standard sunscreens.

Assume Nothing

To help patients protect themselves from skin cancer, we must offer clear advice on sunscreen selection, stress the need for sun avoidance and use of physical skin protection, and be prepared to help them reverse damage already done. The patient hand-out below summarizes key patient education tips. Make copies and share them with your patients.

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Sun Safety Questions and Answers for Patients

What is Ultraviolet Radiation?

Ultraviolet radiation (UVR) is light energy from the sun that is invisible to the unaided human eye. It comes in three forms: UVA, UVB, and UVC. The ozone layer blocks most UVC and much of the UVB energy from the sun. Of the three, UVA is most abundant at ground level.

How Does UVR Affect Our Skin?

UVB energy affects the outermost layers of the skin (epidermis) and can cause sunburns. It can also cause cell damage that over time leads to formation of certain types of skin cancer.

UVA penetrates into deeper levels of skin (dermis). Over time damage can produce signs of aging (wrinkling and blotchy skin) as well as certain types of skin cancer, such as melanoma.

Can We Avoid UVR?

UVR is everywhere around us, and there are even detectable levels at night. Physical objects (trees, walls, some clothing, etc.) can block UV radiation. The best way to avoid dangerous levels of UVR is to avoid direct sunlight.

What About Sunscreens?

Sunscreens help protect the skin from UVR. Some sunscreen ingredients are called "physical sunscreens." These include zinc oxide and titanium dioxide. These molecules "sit" on the skin and reflect UVR away.

"Chemical sunscreen" ingredients, like avobenzone (Parsol 1789) and oxybenzone, absorb UVR before it affects the skin. Some ingredients block UVA *and* UVB. Some only block UVA *or* UVB.

What is SPF?

SPF stands for sun protection factor, but it's better to think of it as sun*burn* protection factor. It measures protection against UVB but not UVA; a product with a high SPF may not offer good protection against UVA, which also damages the skin.

The higher the SPF number, the greater the protection against UVB. SPF values range from 2 (inadequate protection) to 45. A product with SPF 30 offers more protection than SPF 15, but it does not offer double protection. The SPF system will soon change to a more useful system.

What SPF Should I Use?

Always look for products with a SPF of at least 15 that offer "broad spectrum" protection. Broad spectrum means the sunscreen blocks UVB (measured by SPF) and UVA. Any broad spectrum product will include either avobenzone (Parsol 1789), zinc oxide, or titanium dioxide. Ask your doctor which ingredients he or she thinks you should look for.

How Do I Use Sunscreens?

Apply your sunscreen at least 15 minutes before heading outside. You should apply a broad spectrum sunscreen to sun-exposed skin every day. When you know you'll be outdoors, be sure to re-apply sunscreen according to the product directions. Even if a product is waterproof or sweatproof, you should re-apply it regularly for maximum protection. You need about one ounce of sunscreen to adequately cover your body, plus some more for your face and head. Don't forget to apply sunscreen to your hands, ears, back of your neck, exposed scalp, and feet.

Is Indoor Tanning Safe? What About a "Base Tan"?

Indoor tanning lamps and beds emit UVR identical to the energy from the sun, and it's dangerous. Indoor tanning can cause skin aging and cancer over time. There is no evidence that a "base tan" offers any short- or long-term protection.

"Sunless tanning" with either spray-on tanners or at-home creams and lotions is safe and non-toxic. Note that the main ingredient (DHA) colors the skin but does not protect it from UVR. You still need to use sunscreen.

What Else Should I Do?

Avoid direct sunlight during midday (10 am to 4 pm). If you are going to spend time in the sun, in addition to sunscreen wear a broad-brimmed hat and cover as much of your skin as you can. If possible, wear long sleeves and pants. Some clothes offer more protection than others. Certain companies sell UV-blocking clothing. There are also laundry rinses that add protection to clothes. For information about these, ask your doctor. At the beach or when camping, use UV-proof beach umbrellas, canopies, and tents for protection.

Is it Too Late to Correct Old Damage?

Depending on the extent of the damage, there are medical and cosmetic treatments that can help restore the health and appearance of your skin. There are effective treatments for skin cancer, but early detection is important. See your dermatologist for regular skin exams and always seek medical attention for new or changing moles, freckles, and "spots" on your skin.