Cosmetic and Reconstructive Surgery of the Eye Region
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What You Need to Know About UV light, Vitamin D and Sunscreens

The first step in treating sun damaged (photo damaged) skin is to stop further damage. It makes little sense to spend a lot of time and effort improving the quality of one's skin only to continue to subject it to further insult from ultraviolet (UV) rays. Studies have shown that avoidance of sunlight for several years can actually partially reverse photo damage. In other words, skin protected from continued UV insult has the ability to repair itself to some degree. Therefore, an important step to skin reparation and aging reversal is UV light avoidance. The more avoidance, the more tissue repair.

Vitamin D, an essential vitamin important in decreasing the risk of many diseases, is made in our skin following UV (especially UV-B) exposure. Thus, the question is how much UV light (or sunlight) exposure should we allow so that we produce vitamin D, but don't suffer skin damage? The answer, of course is neither simple nor the same for everyone.

The amount of sun (UV light) exposure required to produce sufficient vitamin D depends upon many factors including the amount of body skin exposed, latitude, elevation above sea level, season, time of day, amount and type of air pollution, and cloud cover (some clouds decrease UV exposure while others actually increase it!) as well as the person's age, health, prior skin damage, and skin color. Darker individuals may require up to 10 times as much UV light exposure to produce the same amount of vitamin D as lighter skinned individuals.

Given the concurrent injury to skin as well as the complexity inherent in calculating the correct sun exposure for an individual, the best solution may be to simply avoid photo damaging sunlight as much as possible and obtain vitamin D through diet.

Currently, the NIH suggests 600 IU/day of vitamin D for adults 19-70 years old, and 800 IU/day over age 70. Doses above 4,000 IU/day run a risk of toxicity. Dietary supplements may be used, but it also helps to know normal dietary sources:

1 Tbsp cod liver oil	1,360 IU
3 oz. salmon	800 IU
8 oz. fortified milk	100 IU
8 oz. fortified juice	100 IU
1 egg yolk	40 IU

To properly avoid UV damaging rays, it is important to understand that there are three main types of UV rays: UVA, UVB, and UVC.

UV-A	400 – 315 nm	Longest wavelength	Wrinkles, long-term skin damage, and some cancer
UV-B	315 – 280 nm		Sunburn, skin cancer
UV-C	280 – 100 nm	Shortest wavelength	Most carcinogenic, but filtered by the ozone

Although UV-C rays are severely damaging to all living things and the most carcinogenic (skin cancer causing), UV-C rays are fully filtered out by the ozone layer – one major reason the ozone is so important.

Practically speaking, UV-B rays are most responsible for sunburns and skin cancers (basal cell and squamous cell carcinomas, not so much melanomas). So, when sunscreens were first developed, they were rated on their ability to block UV-B rays. The SPF (sun protective factor) system was developed in 1962 and was based upon a product's ability to decrease the chance of sunburn (UV-B exposure). A SPF-30 product means that an *average* person might be able to sustain the same UV-B exposure for 30 times as long under laboratory conditions. Thus, a person who could be in the sun for 10 minutes before burning might last 300 minutes with SPF-30 screen. *That's in the laboratory!* In the real world, on the beach without water contact or without rubbing off the screen by lying on a towel, properly applied SPF-30 provides about half as much protection or about 15 times the protection, not 30. Water contact, excessive sweating, and physical contact with clothing, sand, or a towel may considerably decrease the effect.

The controversy, however, about how protective sunscreens are and how long they last is rapidly growing. Amazingly, a growing body of data suggests that applying sunscreen just once, but staying in the sun, may actually potentiate UV injury and be more damaging than not applying the sunscreen at all due to free-radical chemicals in the sunscreen that are absorbed into the skin and then combine with UV radiation injury. For the very best protection, some researchers suggest reapplying sunscreen every SPF/2 minutes, i.e. applying a SPF-30 product every 15 minutes while in full sun exposure.

UV-A rays (often called "tanning rays") penetrate more deeply into the skin than UV-B rays and stimulate freckle and pigment spot formation, have been implicated more than UV-B in causing some melanomas, and create the vast majority of the long-term aging and wrinkle changes in the skin. UV-A long-term damage may not appear for many years. Remember, UV-A radiation is present rain or shine, 365 days per year.

Since SPF rating is based upon UV-B exposure and different materials block different UV light waves, a SPF-70 product may have no significant UV-A blocking effect. In January, 2014, FDA regulations required all sunscreen labels to document many things including whether or not there was UV-A protection. However, the criteria to claim UV-A protection is based upon a relatively weak pass/fail test, so a product which provides 99% UV-B protection and as little as 1% UV-A protection may be classified as "Broad Spectrum" sunscreen, and the SPF number which is still base upon sunburn assessment has no relation to the amount of UV-A, wrinkle, or long-term skin health protection. European standards for sunscreen ratings based upon a proprietary system are much more meaningful for UV-A protection, and many more products are available which have not yet passed FDA approval.

Some interesting facts:

- Ordinary window glass filters out >90% of UV-B, but only about 10-20% of UV-A. So sitting in the sun in your breakfast nook every morning can potentiate skin damage and wrinkling.
- Car windshields filter out 95-99% of UV-A and UV-B rays, whereas the side windows block only 30-40% of UV-A. A half-hour commute every day heading along the North-South axis may provide significant exposure to just half the face (the same half in the morning as the sun rises as in the early evening traveling in the opposite direction as the sun sets).

- Most eyeglasses these days are not glass, but if they are, they behave like window glass above. Regular plastic eyeglass lenses also block most UV light (around 90+%), but adding a UV-blocking dye boosts UV protection to nearly 100%. Other high-index, higher strength and lower weight plastic lens materials, including polycarbonate, have 100 percent UV protection built-in, so extra lens treatments are not necessary. Photochromic lenses (those that change tint) also block 100% of the sun's UV rays. In non-photochromic lenses (sunglasses that don't lighten or darken), the visible tint (color and degree of darkness) has no relationship to the amount of UV blockage. Wraparound glasses or those with side panels are preferable to small spectacles because of the added protection to the outside portion of the eyes and eyelids, common areas for cancers and photoaging changes.

SUNSCREENS

Sunscreens can be broken down into two types: physical block and chemical block.

Physical blocks create a physical barrier to all of the UV rays, reflecting the rays away from the skin. The classic physical block sunscreens are the inorganic or mineral-based zinc oxide or titanium dioxide creams - long popular with lifeguards to protect their noses and lips. Recent research suggests that zinc oxide may be slightly superior in UV-A blockage. While both zinc and titanium are highly effective and generally non-allergenic, people usually avoid using these products because of the mess and appearance. Now these products are prepared in a "micronized" form, which makes it almost transparent except for a fine milky shiny film. However, these products should not be used on open wounds because of the possibility of systemic absorption. Additionally, efforts to make the particles progressively smaller have raised safety concerns about increasing absorption through intact skin and resultant cellular interactions.

Chemical blocks rely on the absorption of the UV light by the active sunscreen chemical(s). PABA (para-aminobenzoic acid) was formerly the most common agent, but because of the high rate of allergy, an inability to block UV-A rays, and a question of an association with increased DNA defects in the skin, it has been replaced by other agents such as oxybenzone, octinoxinate, and methoxycinnate, all of which only <u>partly</u> screen UV-A rays. Oxybenzone can also cause allergic reactions and recently has been found to be absorbed and detected in the bloodstream possibly affecting hormone levels.

As mentioned, UV-A is currently not rated in the SPF ratings. There are only a couple of UV-A blocking chemicals approved for use in the U.S. Parsol 1789® (avobenzone) is effective but breaks down in sunlight and can decrease the effectiveness of octinoximate (a UV-B blocker) if used at the same time. Ecamsule (Mexoryl SX®) is a very effective proprietary ingredient of L'Oreal, but it is only FDA approved for use in a few specific formulations and only one sunscreen (Anthelios®). Two other excellent long-term UV-A blockers awaiting approval are Tinosorb S and Tinosorb M. All of these products have been readily available in a variety of sunscreens and safely used in Europe since the early 1990s.

TIPS FOR APPLYING SUNSCREENS

For maximal skin protection and rejuvenation, sunscreens should be worn everyday – regardless of whether you plan to be outdoors for short or extended periods. Because UV damage is cumulative in its effects, the prevention of even small amounts of daily sun damage over a long period of time can have a profound impact on the total amount of UV damage to the skin.

- Apply sunscreen daily to exposed areas: face, neck, chest, arms, legs, back of hands, top of ears, and top of feet. On the face, apply the sunscreen all the way up to the lower eyelashes, but avoid sunscreen directly over the eyes in the upper eyelids, as sunscreen can be very irritating if it drips into the eyes. Compensate by wearing UV blocking glasses or an appropriate hat.
- Most people apply about half the amount of sunscreen used by researchers when testing SPF ratings. Therefore, don't hesitate to apply sunscreen more thickly.
- For best protection, use a moisture-based, broad-spectrum chemical sunscreen (SPF-30 or higher) and then 20-30 minutes later apply a physical sunscreen (zinc oxide or titanium dioxide) if you are going to be subjected to extreme amounts of UV exposure from both above and below as occurs in areas of highly reflective surfaces, such as at the beach, on a boat, or skiing on snow.
- Chemical sunscreens take about half an hour to work, so apply at least 30 minutes before going out in the sun.
- If perspiring heavily or swimming, use a sunscreen that is labeled "water resistant" and rated as either "40" or "80", indicating the *average* number of minutes for which the product can be submersed with continued protection.

HATS

Pick a hat you will feel comfortable wearing because if you feel foolish you probably won't wear it. A broad brim hat is the best protection. Try to find a hat with a dark, non-reflective undersurface under the brim. This keeps UV rays from reflecting from concrete pavement, white sand, water, or snow to the underside of your hat and then ricocheting into your eyes. The top of the hat should be light colored, to decrease solar heat absorption, ventilated, and UV protection rated, especially for balding men. For clothing, UPF (UV protective factor) is the rating system, rather than SPF. Like sunglasses, when it comes to protective hats, bigger is better.

*** We recommend **Colorescience** SUNFORGETTABLE® BRUSH-ON SHIELD SPF 50