THE SUNSCREEN–EYE HEALTH CONNECTION

Consider these factors when talking to patients about sun protection.

BY JESSILIN QUINT, OD, MS, MBA, FAAO

The warmer months are upon us, which means many people will be spending more time outside soaking up the sun. A common and well-known risk factor for skin cancer is prolonged UV radiation from sun exposure.

The periocular region (the eyelids) makes up only 1% of the body's surface area, yet it accounts for between 5% and 10% of all skin cancers.[1] It is believed that this is because most people do not apply sunscreen to their eyelids or do not wear proper ocular sun protection.[2] Eyelid skin is uniquely thin (<0.2 mm thick), putting it at high risk for photodamage.[3]

Should optometrists and other eye care providers be discussing and recommending that patients apply sunscreen to their eyelids? Absolutely. But first we need to recognize how the ingredients of these products can affect eye health. In this article I discuss five important facts about sunscreen. Know these, and you can rest assured you're making the best recommendations to your patients.

FIVE FACTS YOU SHOULD KNOW ABOUT SUNSCREEN

No. 1: UV-A/UV-B Basics

If we think back to optics class, we might remember that UV light has shorter wavelengths than visible light, which means we can't see it. But it can greatly affect the skin. There are three main subdivisions of UV light. UV-C is absorbed 100% by the ozone. UV-A and UV-B wavelengths are transmitted through the atmosphere and are associated with increased risk of skin damage.

UV-A has longer wavelengths (315-400 nm) and is more strongly associated with aging, pigmentation, and increases in the number of inflammatory cells in the dermis. UV-B has shorter wavelengths (280-315 nm) and is more strongly associated with skin burning and DNA strand breaks.[4]

No. 2: Product Labeling

Regulation of photoprotection products, including sunscreen, varies per country. Because of this, sunscreen labeling and protection scoring also

COMMON CHEMICAL INGREDIENTS IN SUNSCREEN

UV-A Blockers

- anthranilates
- avobenzones
- benzophenones
- ecamsule

UV-B Blockers

- aminobenzoates
- camphor derivatives
- cinnamates
- ensulizole
- octocrylene
- salicylates

vary. In the United States, sunscreen products are regulated by the FDA, which is expected to promulgate new labeling categories later this year.[4-6]

Sun protection factor (SPF) measures UV-B transmission; it is the ratio of the amount of UV radiation required to burn protected skin to that of unprotected skin. An SPF of 30 means it would take 30 times longer to burn protected versus unprotected skin. An SPF of 15 provides 93% protection from UV-B, SPF 30 provides 97% protection, and SPF 50 provides 98% protection.

Beware of products with high SPF values (eg, SPF 100), as these often do not statistically offer much more protection than products with lower SPF values and always have a substantial chemical ingredient profile.

Persistent pigment darkening (PPD) is a test used primarily in Asia and Europe to measure UV-A. This measure describes how much persistent darkening (tanning) of the skin is caused by UV-A. PPD ratings range from 0 to 16+. A PPD of 10 means that it will take around 10 times longer for protected skin to tan compared to unprotected skin. The higher the PPD number, the more UV-A protection the product allegedly provides.

Protection grade of UV-A rays (PA) is a rating system established in Japan, adapted from the PPD method.

- PPD 2-4 = PA+ (some UV-A protection)
- PPD 4-8 = PA++ (moderate UV-A protection)
- PPD 8-16 = PA+++ (high UV-A protection)
- PPD 16+ = PA++++ (extremely high UV-A protection)

Broad spectrum, describing a product's protection grade against UV-A, is a label primarily used in North America. The actual protection from UV-A under this category is vague, but it does indicate some level of UV-A coverage. For a product to achieve a "broad spectrum" rating, it must absorb 90% of total UV light at wavelengths below 370 nm.

Reef-safe or *reef-friendly* is a label used to identify products that do not contain chemicals known to cause harm to marine ecosystems. Oxybenzone and octinoxate are two ingredients toxic to marine life that have been banned in many places including Hawaii; Key West, Florida; and the US Virgin Islands.

No. 3: Chemical Versus Mineral

Both *chemical* and *mineral* categories of sunscreen shield skin from UV light, but each has a different mechanism of action. Chemical (organic) sunscreens work by allowing UV light to penetrate the skin. As the light enters, it reacts with the chemical ingredients (see *Common Chemical Ingredients in Sunscreen*) to cause a reaction that converts the UV light to heat, which is then dissipated from the skin.

In contrast, mineral (also called inorganic or physical) sunscreens contain ingredients that sit on top of the skin to deflect or scatter UV rays so there is no penetration by those UV rays. Common mineral sunscreen ingredients include zinc oxide and titanium dioxide. Zinc oxide is more protective against UV-A light, whereas titanium dioxide is more protective against UV-B light.[7]

No. 4: Ingredients

It is vital to read both the active and inactive ingredient deck of sunscreen products. The same preservatives and ingredients that are harmful to eye health in skin care and makeup products are often also present in sunscreen. You don't want to recommend a sunscreen product for eyelid application that is going to lead to dry eye disease, ocular surface disruption, dermatitis, or meibomian gland dysfunction. Furthermore, chemical sunscreen ingredients can cause skin inflammation and

AT A GLANCE

- ▶ UV-A and UV-B light wavelengths are transmitted through the atmosphere, and they are associated with risk of skin damage.
- ▶ For a sunscreen product to achieve a "broad spectrum" rating, it must absorb 90% of total UV light at wavelengths below 370 nm.
- ▶ Proper application and reapplication are just as important as the type of sunscreen used.

irritation in addition to initiating rosacea flare-ups, systemic hormone disruption, and even cancer. Because of this, many dermatologists prefer to recommend mineral sunscreen products.[8]

No. 5: Application

Proper application and reapplication are just as important as the type of sunscreen used. Many patients avoid the periocular region during application.[2] Best practice is to apply sunscreen 30 minutes before heading outside and then reapply every 2 hours. Sunscreen should be immediately reapplied after swimming or excessive sweating. It should also be worn on cloudy days and indoors if windows are present.

For makeup wearers, there are now sunscreen powders and setting sprays available to allow reapplication without smearing makeup. The sunscreen in makeup alone often does not provide enough protection from UV-A and UV-B rays.

A DUTY TO EDUCATE

It is important for optometrists to be knowledgeable about how sunscreen products and their use can affect ocular health. And, although further research is needed, we have the responsibility as primary eye care providers to have a discussion with our patients about photoprotection in the periocular region. Sunglasses and hats are important, but sunscreen application to the eyelids in a safe way is also needed.

As Ben Franklin wrote, "An ounce of prevention is worth a pound of cure." Let's protect our patients and educate them on this important topic. ■

1. Cook BE, Bartley GB. Epidemiologic characteristics and clinical course of patients with malignant eyelid tumors in an incidence cohort in Olmsted County, Minnesota. *Ophthalmology*. 1999;106(4):746-750.
2. Langelier NA, Liss J, Stinnett S, Woodward JA. Completeness of facial self-application of sunscreen in cosmetic surgery patients. *Cutis*. 2017;99(6):E16-E18.
3. Pilkington SJ, Belden S, Miller RA. The tricky tear trough: A review of topical cosmeticeutials for periorbital skin rejuvenation. *J Clin Aesthet Dermatol*. 2015;8(9):39-47.
4. Gabros S, Nessel TA, Zito PM. Sunscreens and photoprotection. *StatPearls*. Treasure Island, Florida: StatPearls Publishing; April 8, 2020.
5. Latha MS, Martis J, Shobha V, et al. Sunscreening agents: a review. *J Clin Aesthet Dermatol*. 2013;6(1):16-26.
6. McMahon S. 6 destinations with sunscreen bans, and what you need to know. *Smarter Travel*. August 20, 2019. www.smartertravel.com/sunscreen-ban-destinations/. Accessed May 1, 2020.
7. Schneider SL, Lim HW. A review of inorganic UV filters zinc oxide and titanium dioxide. *Photodermatol Photoimmunol Photomed*. 2018;35:442-446.
8. Ruszkiewicz JA, Pinkas A, Ferrer B, Peres TV, Tsatsakis A, Aschner M. Neurotoxic effect of active ingredients in sunscreen products, a contemporary review. *Toxicol Rep*. 2017;4:245-259.

JESSILIN QUINT, OD, MS, MBA, FAAO

- Owner and Optometrist, Smart Eye Care, Augusta, Bangor, and Farmingdale, Maine
- quint.jessilin@gmail.com; Instagram @jessilinquint

- Financial disclosure: Consultant (Allergan)