

Sun



The Burning Facts

Screen

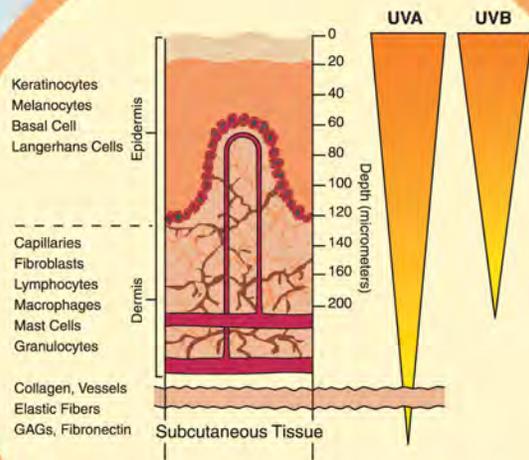
Although the sun is necessary for life, too much sun exposure can lead to adverse health effects, including skin cancer. More than 1 million people in the United States are diagnosed with skin cancer each year, making it the most common form of cancer in the country, but it is largely preventable through a broad sun protection program. It is estimated that 90 percent of non-melanoma skin cancers and 65 percent of melanoma skin cancers are associated with exposure to ultraviolet (UV) radiation from the sun.¹

By themselves, sunscreens might not be effective in protecting you from the most dangerous forms of skin cancer. However, sunscreen use is an important part of your sun protection program. Used properly, certain sunscreens help protect human skin from some of the sun's damaging UV radiation. But according to recent surveys, most people are confused about the proper use and effectiveness of sunscreens.² The purpose of this fact sheet is to educate you about sunscreens and other important sun protection measures so that you can protect yourself from the sun's damaging rays.



How Does UV Radiation Affect My Skin? What Are the Risks?

UV radiation, a known carcinogen, can have a number of harmful effects on the skin. The two types of UV radiation that can affect the skin—UVA and UVB—have both been linked to skin cancer and a weakening of the immune system. They also contribute to premature aging of the skin and cataracts (a condition that impairs eyesight), and cause skin color changes.



Penetration of UV Into the Skin

UVA Rays

UVA rays, which are not absorbed by the ozone layer, penetrate deep into the skin and heavily contribute to premature aging. Up to 90 percent of the visible skin changes commonly attributed to aging are caused by sun exposure.³

UVB Rays

These powerful rays, which are partially absorbed by the ozone layer, mostly affect the surface of the skin and are the primary cause of sunburn. Because of the thinning of the ozone layer, the effects of UVB radiation will pose an increased threat until the layer is restored in the latter half of the 21st century.

Are Some People Predisposed to Adverse Health Effects Resulting From Sun Exposure?

Everybody, regardless of race or ethnicity, is subject to the potential adverse effects of overexposure to the sun. However, some people are more vulnerable than others to the harmful effects of the sun.

Skin Type

Skin type affects the degree to which some people burn and the time it takes them to burn. The Food and Drug Administration (FDA) classifies skin type on a scale from 1 to 6. Individuals with lower number skin types (1 and 2) have fair skin and tend to burn rapidly and more severely. Individuals with higher number skin types (5 and 6), though capable of burning, have darker skin and do not burn as easily.

¹ Armstrong, B.K., and A. Kricger, *How much melanoma is caused by sun exposure?*, *Melanoma Research*, 1993; 3:395-401.

² IARC Working Group (2001) *Sunscreens* (IARC Handbooks of Cancer Prevention, Vol. 5), Lyon, International Agency for Research on Cancer, pp. 23-52.

³ Taylor, C.R. et al, *Photoaging/Photodamage and Photoprotection*, *J Am Acad Dermatol*, 1990; 22: 1-15.

⁴ American Academy of Pediatrics, *Ultraviolet Light: A Hazard to Children*, *Pediatrics*, 1999;104: 328-333.

⁵ Ries, L.A.G, D. Harkins, M. Krapcho, A. Mariotto, B.A. Miller, N. Howlander, M. Hayat, B.F. Hankey, B.K. Edwards (eds), *SEER Cancer Statistics Review, 1975-2003*, National Cancer Institute, Bethesda, MD, http://seer.cancer.gov/csr/1975_2003/, based on November 2005 SEER data submission, posted to the SEER Web site, 2006.

⁶ Strouse, J., T. Fears, M. Tucker, A. Wayne, *Pediatric Melanoma: Risk Factor and Survival Analysis of the Surveillance, Epidemiology and End Results Database*, *Journal of Clinical Oncology*, 2005; 23: 4735-4741.

⁷ Wolpowitz, D. and B.A. Gilchrist, *The vitamin D questions: How much do you need and how should you get it?*, *J Am Acad Dermatol*, 2006; 54:301-317.

⁸ IARC Working Group (2001) *Sunscreens* (IARC Handbooks of Cancer Prevention, Vol. 5), Lyon, International Agency for Research on Cancer, pp. 148-149.



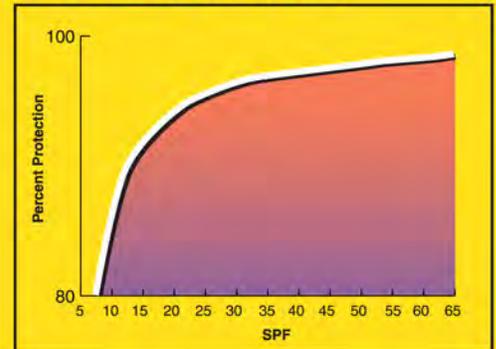
How Do Sunscreens Work? What Is the Sun Protection Factor (SPF)?

Sunscreens protect your skin by absorbing and/or reflecting UVA and UVB rays. The FDA requires that all sunscreens contain a Sun Protection Factor (SPF) label. The SPF reveals the relative amount of sunburn protection that a sunscreen can provide an average user (tested on skin types 1, 2, and 3) when correctly used.

Sunscreens with an SPF of at least 15 are recommended. You should be aware that an SPF of 30 is not twice as protective as an SPF of 15; rather, when properly used, an SPF of 15 protects the skin from 93 percent of UVB radiation, and an SPF 30 sunscreen provides 97 percent protection (see chart to the right).

Although the SPF ratings found on sunscreen packages apply mainly to UVB rays, many sunscreen manufacturers include ingredients that protect the skin from some UVA rays as well. **These “broad-spectrum” sunscreens are highly recommended.**

SPF vs. UVB protection

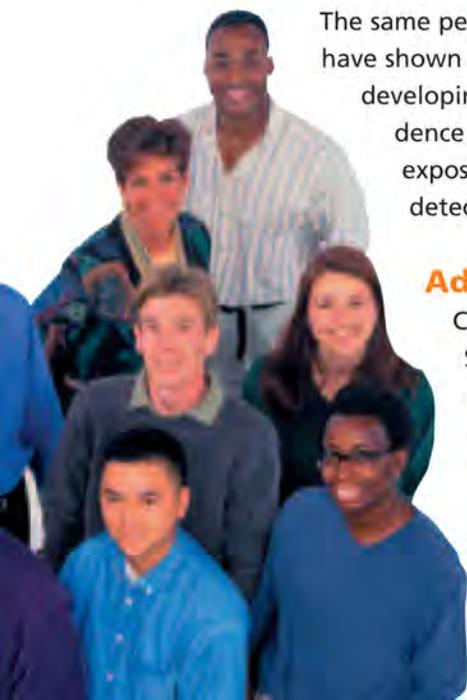


Are Some People Predisposed to Adverse Health Effects Resulting From Sun Exposure? (Continued)

The same people who are most likely to burn are also most vulnerable to skin cancer. Studies have shown that individuals with large numbers of freckles and moles also have a higher risk of developing skin cancer. Although people with higher-number skin types have a lower incidence of skin cancer, they should still take action to protect their skin and eyes from over-exposure to the sun, since cases of skin cancer in people with darker skin are often not detected until later stages when it is more dangerous.

Additional factors

Certain diseases, such as lupus, can also make a person more sensitive to sun exposure. Some medications, such as antibiotics and antihistamines and even certain herbal remedies, can cause extra sensitivity to the sun's rays. Discuss these issues with your physician.



What Are the Active Ingredients in Sunscreen?

Chemical Ingredients

Broad-spectrum sunscreens often contain a number of chemical ingredients that absorb UVA and UVB radiation. Many sunscreens contain UVA-absorbing **avobenzone** or a **benzophenone** (such as dioxybenzone, oxybenzone, or sulisobenzene), in addition to UVB-absorbing chemical ingredients (some of which also contribute to UVA protection). In rare cases, chemical ingredients cause skin reactions, including acne, burning, blisters, dryness, itching, rash, redness, stinging, swelling, and tightening of the skin. Consult a physician if these symptoms occur. These reactions are most commonly associated with para-aminobenzoic acid (PABA)-based sunscreens and those containing benzophenones. Some sunscreens also contain alcohol, fragrances, or preservatives, and should be avoided if you have skin allergies.

Physical Ingredients

The physical compounds titanium dioxide and zinc oxide reflect, scatter, and absorb both UVA and UVB rays. These ingredients, produced through chemical processes, do not typically cause allergic reactions. Using new technology, the particle sizes of zinc oxide and titanium dioxide have been reduced, making them more transparent without losing their ability to screen UV.

Summary

All of the previously mentioned chemical and physical ingredients have been approved by the FDA. The following table lists these ingredients and includes information regarding the type and amount of ray protection that they provide and their class.

FDA Monograph Sunscreen Ingredients	Amount of Ray Protection		Chemical (C) or Physical (P)
	UVA	UVB	
Aminobenzoic acid (PABA)	○	●	C
Avobenzone	●	◐	C
Cinoxate	◐	●	C
Dioxybenzone	◐	●	C
Ecamsule	●	◐	C
Homosalate	○	●	C
Menthyl anthranilate	◐	●	C
Octocrylene	◐	●	C
Octyl methoxycinnamate	◐	●	C
Octyl salicylate	○	●	C
Oxybenzone	◐	●	C
Padimate O	○	●	C
Phenylbenzimidazole	○	●	C
Sulisobenzene	◐	●	C
Titanium dioxide	◐	●	P
Trolamine salicylate	○	●	C
Zinc Oxide	●	●	P

Protection Level: ● = extensive ◐ = considerable ◑ = limited ○ = minimal

For the most up-to-date information on approved sunscreen ingredients, visit the FDA Web site at <www.fda.gov>.



How Can I Maximize My Sun Protection?

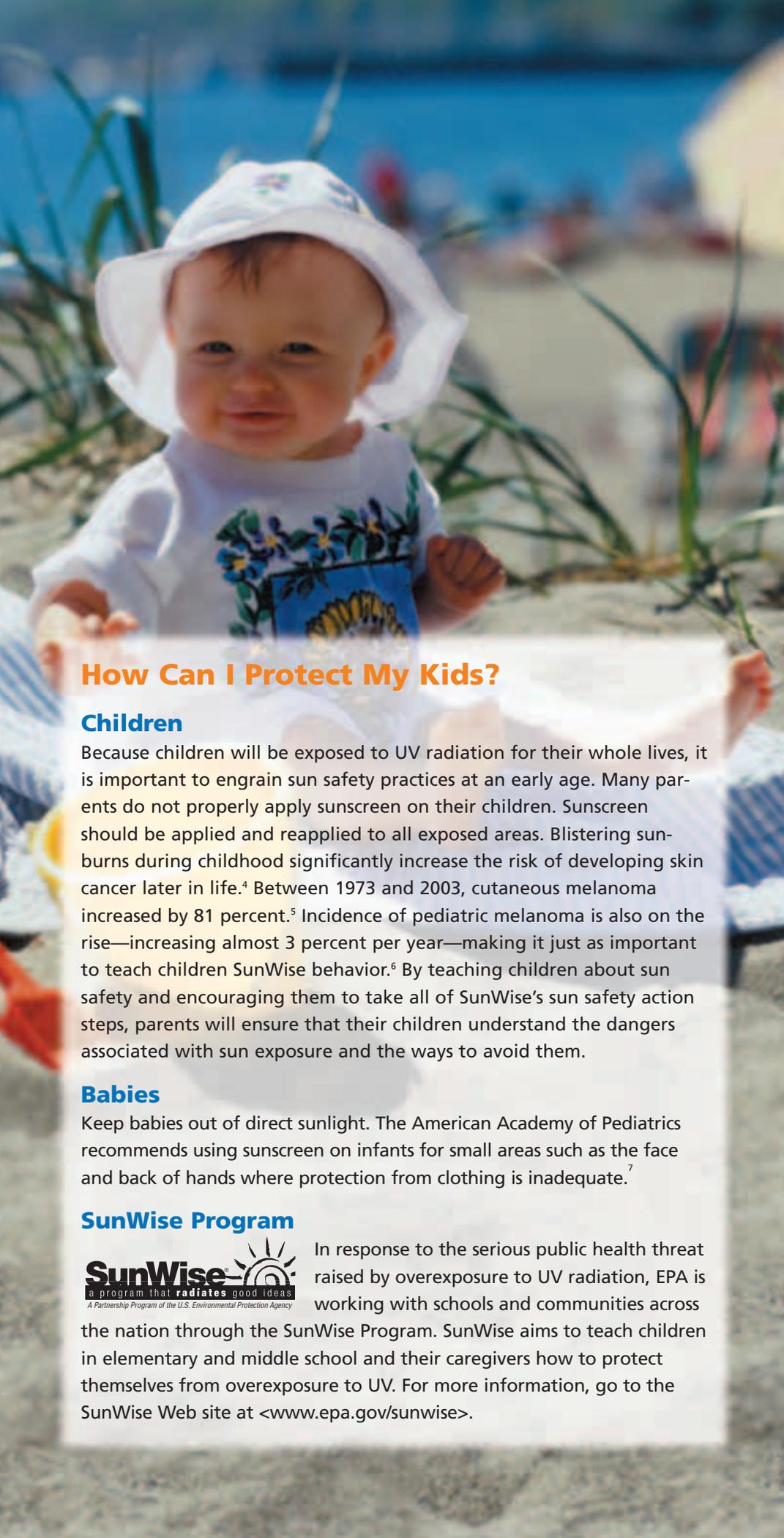
Because the active sunscreen ingredients will not usually block out the complete spectrum of UVA and UVB rays, sunscreens by themselves might not offer enough protection to prevent skin cancer and some of the other sun-related ailments. To thoroughly protect yourself, you should take as many of the following **action steps** as you can:

- Do Not Burn
- Avoid Sun Tanning and Tanning Beds
- Generously Apply Sunscreen
- Wear Protective Clothing
- Seek Shade
- Use Extra Caution Near Water, Snow, and Sand
- Watch for the UV Index
- Get Vitamin D Safely

Can I Get a Tan Without UV?

Sunless tanners and bronzers are applied to the skin like a cream and can provide a temporary, artificial tan. The only color additive currently approved by FDA for this purpose is dihydroxyacetone (DHA). Application can be difficult, and areas of the skin can react differently, resulting in an uneven appearance.

Bronzers stain the skin temporarily, and they can generally be removed with soap and water. They may streak after application and can stain clothes. Sunless tanners and bronzers might not contain active sunscreen ingredients. Read their labels to find out if they provide any sun protection.



How Can I Protect My Kids?

Children

Because children will be exposed to UV radiation for their whole lives, it is important to engrain sun safety practices at an early age. Many parents do not properly apply sunscreen on their children. Sunscreen should be applied and reapplied to all exposed areas. Blistering sunburns during childhood significantly increase the risk of developing skin cancer later in life.⁴ Between 1973 and 2003, cutaneous melanoma increased by 81 percent.⁵ Incidence of pediatric melanoma is also on the rise—increasing almost 3 percent per year—making it just as important to teach children SunWise behavior.⁶ By teaching children about sun safety and encouraging them to take all of SunWise's sun safety action steps, parents will ensure that their children understand the dangers associated with sun exposure and the ways to avoid them.

Babies

Keep babies out of direct sunlight. The American Academy of Pediatrics recommends using sunscreen on infants for small areas such as the face and back of hands where protection from clothing is inadequate.⁷

SunWise Program



In response to the serious public health threat raised by overexposure to UV radiation, EPA is working with schools and communities across the nation through the SunWise Program. SunWise aims to teach children in elementary and middle school and their caregivers how to protect themselves from overexposure to UV. For more information, go to the SunWise Web site at <www.epa.gov/sunwise>.

Is a Suntan Healthy?

There is no such thing as a healthy suntan. Any change in your natural skin color is a sign of skin damage. Every time your skin color changes after sun exposure, your risk of developing sun-related ailments increases.

Will Sun Protection Deprive Me of Vitamin D?

Most people get an adequate amount of vitamin D in their diets. If you are concerned about not getting enough vitamin D, consult your physician and consider taking a multivitamin supplement and consuming foods and beverages fortified with vitamin D daily.⁸

Are Tanning Lotions Safe?

The FDA considers it an important public health issue that users of sun-tanning products be told when the products do not contain a sunscreen and thus, do not protect against sunburn or other harmful effects to the skin. The FDA requires that all such products carry the following label:

“Warning—This product does not contain a sunscreen and does not protect against sunburn. Repeated exposure of unprotected skin while tanning may increase the risk of skin aging, skin cancer, and other harmful effects to the skin even if you do not burn.”

(Title 21 of the Code of Federal Regulations, Section 740.19)



How Does the Outside Environment Influence Exposure?

The intensity of the sun's UV rays reaching the Earth's surface varies and should be considered when you plan outdoor activities. The National Weather Service issues the UV Index, a daily forecast of UV intensity, for the United States.

The UV Index

Index Number	Exposure Level
≤ 2	Low
3 to 5	Moderate
6 to 7	High
8 to 10	Very High
11+	Extreme

You can obtain your local UV Index forecast daily from local weather stations or newspapers. EPA's Web site provides daily local UV forecasts for your ZIP Code or city and state at <www.epa.gov/sunwise/uvindex.html>.

The higher the UV Index forecast, the stronger the sun will be and the greater the need to follow all the sun protection action steps. For days when the UV Index is unseasonably high for a particular location, EPA issues a UV Alert. You can sign up to receive an

email-based UV Alert or daily UV Index forecast by going to <<https://enviroflash.epa.gov>> and entering your e-mail address and ZIP Code or city and state.

In general, UV strength is greatest from 10 a.m. to 4 p.m. during sunny summer days. Up to 80 percent of UV rays pass through clouds, however, meaning that sunburn is possible on cloudy days as well. UV exposure is greater at low latitudes (nearer to the equator) and/or high altitudes. Snow, water, and sand also increase sun exposure by reflecting incoming UV rays, making it especially important for skiers, boaters, and beachcombers to wear clothing and hats and apply sunscreen.

How Do I Apply Sunscreen?

Use a broad-spectrum sunscreen with an SPF rating of 15 or higher. Apply sunscreen 20 minutes before going out into the sun (or as directed by the manufacturer) to give it time to absorb into your skin. Apply it generously and regularly—about 1 ounce every 2 hours—and more often if you are swimming or perspiring. A small tube containing between 3 and 5 ounces of sunscreen might only be enough for one person during a day at the beach.

Do not forget about lips, ears, feet, hands, bald spots and the back of the neck. In addition, apply sunscreen to areas under bathing suit straps, necklaces, bracelets, and sunglasses. Keep sunscreen until the expiration date or for no more than 3 years, because the sunscreen ingredients might become less effective over time.

According to the FDA, "water resistant" sunscreens must maintain their SPF after 40 minutes of water immersion, while "very water resistant" sunscreens must maintain their SPF after 80 minutes of water immersion. Either type of water-resistant sunscreen must be reapplied regularly, as heavy perspiration, water, and towel drying remove the sunscreen's protective layer.



Is Sunscreen Fail-Safe?

Using sunscreen does not mean it is safe to spend more time in the sun, especially when the UV Index is high. Although a sunscreen with an SPF of 15 or higher offers protection from sunburn, it does not block all of the sun's damaging rays. In fact, there is no evidence that sunscreens protect you from malignant melanoma, the deadliest form of skin cancer, even though sunburns have been linked with the development of melanoma. There is only limited evidence that sunscreens protect you from several other types of skin cancer.⁹ To fully protect yourself, remember to seek shade, minimize peak hours of sun exposure, and wear protective clothing in addition to applying sunscreen.



PREVENT EYE DAMAGE

Protect Yourself from UV Radiation



Most Americans understand the link between ultraviolet (UV) radiation and skin cancer. Many are less aware of the connection between UV radiation and eye damage. With increased levels of UV radiation reaching the Earth's surface, largely due to stratospheric ozone layer depletion, it is important to take the necessary precautions to protect your eyes.

Potential Effects of UV Radiation on Eyes

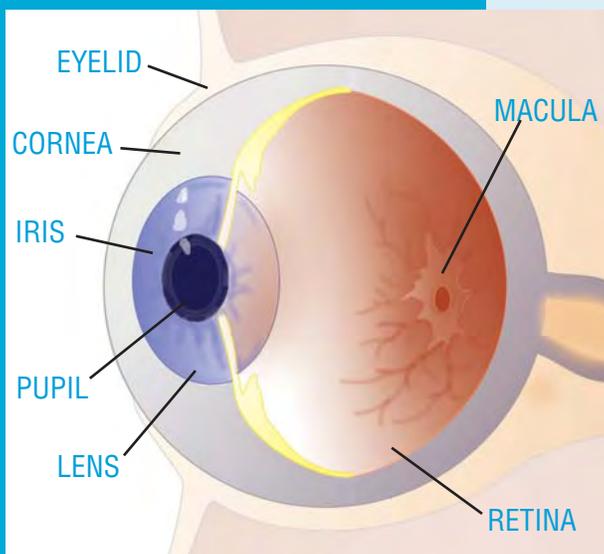
UV radiation, whether from natural sunlight or artificial UV rays, can damage the eye, affecting surface tissues and internal structures, such as the cornea and lens.

Long-term exposure to UV radiation can lead to cataracts, skin cancer around the eyelids, and other eye disorders.

In the short-term, excessive exposure to UV radiation from daily activities, including reflections off of snow, pavement, and other surfaces, can burn the front surface of the eye, similar to a sunburn on the skin.

The cumulative effects of spending long hours in the sun without adequate eye protection can increase the likelihood of developing the following eye disorders:

- ☀ **Cataracts:** A clouding of the eye's lens that can blur vision.
- ☀ **Snow Blindness (Photokeratitis):** A temporary but painful burn to the cornea caused by a day at the beach without sunglasses; reflections off of snow, water, or concrete; or exposure to artificial light sources such as tanning beds.
- ☀ **Pterygium:** An abnormal, but usually non-cancerous, growth in the corner of the eye. It can grow over the cornea, partially blocking vision, and may require surgery to be removed.
- ☀ **Skin Cancer around the Eyelids:** Basal cell carcinoma is the most common type of skin cancer to affect the eyelids. In most cases, lesions occur on the lower lid, but they can occur anywhere on the eyelids, in the corners of the eye, under the eyebrows, and on adjacent areas of the face.



EPA's SunWise Program: Educating Youth About Sun Safety

The SunWise Program is an environmental and health education program that aims to teach people how to protect themselves from overexposure to the sun. The school element of the program uses classroom, school, and community components to develop sustained sun-safe behaviors in children. Additional partnerships with local broadcast meteorologists, science centers, children's museums, and health experts provide numerous opportunities to deliver the SunWise message to youth, their care givers, and the general public. For more information about SunWise and how you can participate, please visit www.epa.gov/sunwise.



Did You Know....

- 20.5 million Americans have cataracts.
- The economic costs of visual disorders and disabilities in the United States in 2003 was estimated to be \$68 billion.

Source: National Eye Institute www.nei.nih.gov, National Institutes of Health, U.S. Department of Health and Human Services

Preventative Measures for Eye Protection

The greatest measure of UV protection is achieved with a combination of UV-absorbing sunglasses, a wide-brimmed hat, and for those who wear contact lenses, UV-blocking contacts.

Look for sunglasses that block 99-100 percent of UV-A and UV-B radiation. Wrap-around sunglasses and wide-brimmed hats add extra layers of protection because they block UV rays from entering the eyes from the sides and above. UV-blocking contact lenses provide added protection against the direct and reflected rays that are not blocked by sunglasses or hats. As is the case with overall sun safety, a combination approach works best.

Frequently Asked Questions

- Q: Does my eye color or skin color affect my risk for eye damage from UV radiation?
- A: While studies show an increased incidence of cataracts in dark brown irises, people with all eye and skin colors are susceptible to UV eye damage.
- Q: What should I look for when choosing a pair of sunglasses?
- A: No matter what sunglass styles or options you choose, you should insist that your sunglasses:
- Block out 99-100 percent of both UV-A and UV-B radiation.
 - Are perfectly matched in color and are free of distortion and imperfection.
- Q: Do I have to buy expensive sunglasses to ensure that I am being protected from UV radiation?
- A: No. As long as the label says that the glasses provide UV-A and UV-B protection, price should not be a deciding factor.
- Q: Do all contact lenses block UV rays?
- A: No. Not all contact lenses offer UV protection and not all provide similar absorption levels. Ask your eye care professional for more information, and remember, a combination approach works best!
- For more information, contact:
- The American Optometric Association www.AOA.org
The American Academy of Ophthalmology www.aao.org
The National Eye Institute www.nei.nih.gov

REMEMBER!

Exposure to UV radiation has cumulative effects on the eyes. Damage today leads to eye problems tomorrow.

**PROTECT YOUR EYES
ALL YEAR-ROUND—
WEAR UV-BLOCKING
LENSES AND A HAT!**

