



Sunscreens Causing Cancer? The Facts

Sheila Jalalat, MD

Recent reports about sunscreen safety have received widespread media attention with headlines on many news broadcasts and Web sites claiming, "Your sunscreen may be giving you cancer." Are claims that deem sunscreens unsafe true? Do the potential risks of sunscreen use outweigh the benefits? As dermatology residents, what do you tell your patients? This article addresses 2 major concerns by providing a critical analysis of the available evidence-based data as well as additional resources for further exploration.

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Skin cancer is the most common form of cancer in the United States and continues to rise in incidence and mortality each year.¹ It is common knowledge that UV light plays a major role in the development of skin cancer.^{2,3} Studies have long demonstrated that using sunscreen on a daily basis can help prevent the development of skin cancer, premature aging, and exacerbation of photodermatoses.^{4,7} Although there are several photoprotective measures available, sunscreen remains the most popular and widely used among patients.⁸ Sunscreens that are on the market today contain

either organic or inorganic UV filters or a combination of both based on their chemical composition and photoprotection mechanisms.⁹ Concerns about these ingredients causing cancer have created confusion among consumers. I will attempt to clarify these concerns by critically analyzing available evidence-based data on sunscreen use so that as dermatology residents we will be more knowledgeable about sunscreen safety topics and will be able to provide accurate and up-to-date information to our patients.

Organic UV Filters

Organic UV filters are classified as aromatic compounds that provide photoprotection by absorbing UV light.¹⁰ Aside from the photoallergic potential of organic UV filters, controversy has arisen in response to studies reporting their possible hormone disruptive effects.¹¹⁻¹⁸ Although there are several US Food and Drug Administration (FDA)-approved organic UV filters in use today, one of the most commonly manufactured and controversial agents is oxybenzone.¹⁰ Claims regarding the estrogenic and antiandrogenic effects of oxybenzone have been investigated with results refuting the claims or concluding that more sensitive studies are needed to determine if these organic ingredients pose such risks.^{10,19,20} One study demonstrated that nearly 300 years of daily sunscreen application would be needed to reach similar exposure levels of oxybenzone used and described in prior animal studies.²¹ Additionally, most of the studied adverse effects of UV filters have been evaluated based on oral exposure rather than actual dermal application.¹¹ Although these compounds are absorbed systemically, studies have reported that the amounts are insignificant and noncumulative in the body.^{10,22-24} Furthermore, the binding affinity of oxybenzone for estrogen receptors has been shown to be much weaker and near insignificant compared to estrogen and estradiol.^{24,25}

From Presence Health Resurrection Medical Center, Chicago, Illinois.
The author reports no conflict of interest.
Correspondence: Sheila Jalalat, MD (sjalalat@gmail.com).

Although numerous important studies examining systemic absorption have not shown a clinically significant disruption of hormonal homeostasis or acute toxicity in humans by organic UV filters, further studies are needed.

Inorganic UV Filters

Used as the main active ingredients in sunscreen for decades, titanium dioxide (TiO₂) and zinc oxide (ZnO) compounds generally are more photostable and less photoallergic than their organic counterparts.¹⁰ In recent years, the safety of these long-used photoprotectors has been questioned because of the development of nanoparticle (<100 nm) formulas that are less opaque on application. Although this formula provides a thin, transparent, and cosmetically appealing medium, there is concern that the metal oxides penetrate the skin and cause local and systemic toxicities.²⁶⁻²⁸ Several recent scientific studies have shown no percutaneous permeation of these particles in normal adult human skin and reported no causal damage to mammalian cells.^{10,29-31} Although skin penetration of TiO₂ and ZnO has been described as insignificant, focus has shifted to health risks associated with inhaling TiO₂ through the use of spray or powder products following statements made by the International Agency for Research on Cancer in 2006.³² Several studies investigating increased health risks, specifically lung cancer, in factory workers who were subjected to TiO₂ and ZnO inhalation concluded that exposure was unlikely to pose substantial health risks or subchronic toxicity.^{33,34} Despite a relatively strong safety profile, a major concern of using these metal oxides as UV filters has been potential free radical formation.³⁵⁻³⁹ For this reason, the Scientific Committee on Emerging and Newly Identified Health Risks extensively researched and delivered opinions on the use of TiO₂ and ZnO in cosmetics, concluding that topical application of either compound does not result in toxicity or other adverse effects.^{30,40-42} Additionally, an effort has been made by manufacturers to encapsulate nanoparticles with magnesium and other materials to quench the reactive oxygen species along with the human body's own antioxidant defense system.¹⁰ In summary, it appears that the current weight of scientific evidence suggests that percutaneous absorption and toxicity by UV filters in humans may be overestimated and that the use of nanoparticles in sunscreens poses no or negligible potential risks to human health.^{43,44}

Concerns Beyond Organic and Inorganic UV Filters

Beyond these concerns with organic and inorganic UV filters, there are several other claims regarding

sunscreen safety that have stirred up controversy, including the side-effect profile of retinyl palmitate, vitamin D deficiency, phototoxicity, environmental effects, futility of sun protection factor levels greater than 50, and increased health risks in children. Although some studies report mixed results, the majority of scientific investigations have addressed and refuted several of these claims, again confirming the relative safety of sunscreen use. It is beyond the scope of this article to further discuss these topics specifically. However, it is worth mentioning that consumer studies report that the actual use of sunscreens is 0.5 mg/cm² or less compared to the ideal application of 2 mg/cm², thereby confounding many of the claims made about sunscreen use, such as vitamin D deficiency.⁴⁵ Sunscreens often contain a combination of several UV filters. To date, only a few existing studies have shown that mixtures of the photoprotective agents discussed might interact and exhibit toxic activity when combined, even when there is no observed adverse toxic effect when used individually in products.⁴⁶⁻⁴⁸

The current FDA ruling on sunscreen labeling does not require manufacturers to state if inorganic UV filters have been formulated into nanoparticles; however, manufacturers are now required to include a statement on all sunscreen labels warning consumers to avoid using sunscreen on damaged or broken skin⁴⁹ in an effort to prevent the active ingredients from getting under the skin, potentially causing inflammation and/or health risks, because available data do not provide conclusive evidence on increased penetration of open skin.⁵⁰ Additional information regarding the 2011 FDA sunscreen ruling can be found in a prior *Cutis* Resident Corner column.⁵¹

Final Thoughts

As health care providers, we should take advantage of opportunities to educate our patients about other sun safety practices, such as avoiding excessive sun exposure during peak hours (10 AM to 2 PM), seeking shade, and wearing photoprotective clothing (eg, wide-brimmed hats, sunglasses).

The research is quite clear: Using broadband sunscreens that absorb and/or block UV radiation results in reduced damage to the skin's DNA, a fact that should be considered when taking into account the risks and benefits of sunscreen use.^{2,3} Although sunscreen use is highly recommended in addition to the other sun protection methods, it is ultimately the patient's choice. If a patient is still concerned about the active ingredients of UV filters, even given the high probability of safety, there are products available on the market that do not include organic filters or nanoparticles. Given the established benefits of

UV protection, the use of sunscreens remain one of the most important photoprotective methods, and with increased usage by the public, continuous monitoring of the overall safety and benefit profile of future products is prudent.

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