

ARTICLE

SUNSCREEN RISKS TO AQUATIC LIFE AND OCEAN ECOSYSTEMS

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SAVE



Giving Compass' Take:

- Research is emerging about the potentially dangerous ingredients in sunscreen that helps protect humans against skin cancer but poses a risk to aquatic life.
- What are the more significant implications for both biological ecosystems and public health? What are the environmental costs?
- Learn more about [sunscreen and coral reef health](#).

Studies have shown that the same active ingredients in sunscreens that protect people from cancer-causing ultraviolet rays can be toxic to a range of species in oceans, rivers and lakes. With both of these risks in mind, a [new report](#) from the National Academies of Sciences, Engineering and Medicine finds an urgent need for more information about whether these chemicals threaten aquatic life on a broad scale.

The report calls on the U.S. Environmental Protection Agency to conduct a detailed review called an [environmental risk assessment](#) of the likelihood that exposure to one or more of these chemicals, called [UV filters](#), may harm organisms in saltwater and freshwater ecosystems. The study recommends focusing on two types of settings – coral reefs in shallow waters near shore, and slow-moving freshwater bodies like ponds and marshes – that are heavily used for recreation and/or exposed to wastewater or urban runoff.

The study recognizes that sunscreen with a Sun Protection Factor (SPF) of 30 or higher is an effective defense against sunburn and skin cancer, and that making it harder to buy broad-spectrum sunscreen that people will actually use could harm public health. Accordingly, it calls for research examining how changes in sunscreen usage could affect human health. Two members of the study committee explain how their group balanced these concerns.

Studies to date have provided compelling laboratory evidence that some UV filters can have toxic effects on aquatic species, including [corals](#), [anemones](#) and [zebrafish](#), that are exposed to the chemicals. These findings have raised concerns about sunscreens' [larger-scale impacts on biological communities and ecosystems](#).

But outcomes in the environment will differ depending on what compounds, ecosystems and local environmental conditions are involved. That's especially true for coral reefs. The committee highlighted reefs because they are [ecologically, economically and culturally valuable](#), and attract large numbers of tourists who use sunscreens. Coral reefs are [declining worldwide](#) due to multiple human-induced disturbances. Some of these disturbances are global, such as [ocean warming and acidification driven by climate change](#). Other stressors, such as coastal water quality, are more local.

Studying the effects of chemicals on corals and coral reefs is challenging because they are both complex systems. Reef-building corals are a combination of an animal, single-celled algae and rich populations of bacteria living and working together. Coral reefs are made up of thousands of interacting organisms.

Importantly, many stress responses in corals occur without causing outright death, but impair their health, growth, resilience and even ability to reproduce. Scientists need to know more about these responses to guide effective management responses and interventions.

After in-depth reviews of the existing data, our study committee recommended that the U.S. Environmental Protection Agency should undertake an ecological risk assessment of the 17 UV filters used in sunscreens sold in the U.S. Such a study would include a comparison of toxicity findings to relevant concentrations and exposure conditions.

For example, what happens to organisms exposed to these chemicals occasionally versus those exposed regularly, in calm bays or along open, wave-swept coasts? How do UV filters differ in whether they break down in water, or accumulate in sediments or the tissues of living organisms?

In our view, an ecological risk assessment would provide EPA and others the basis for sound and effective policy development. The sooner this happens, and the results are applied to the regulatory process, the better for everyone who is affected, including future generations.

Lab results versus real-world conditions

Karen Glanz, George A. Weiss University Professor and Director, UPenn Prevention Research Center, University of Pennsylvania

The question of whether UV filters pose harm to the environment while helping to reduce skin damage and prevent skin cancer is a conundrum. It seemingly pits human and environmental health against each other head-to-head and asks policymakers, medical experts and the public to choose between them.

Humans need sunlight to live, but overexposure to the sun's damaging rays – ultraviolet radiation – causes sunburn and wrinkles and is a risk factor for the development of skin cancers, including the most deadly type, [melanoma](#). Routine use of [broad-spectrum sunscreen with SPF 30+](#) when outdoors has been found to prevent skin damage and

skin cancer. But sunscreens are most effective as part of a [set of behaviors](#) that also includes wearing hats and cover-up clothing and seeking shade. Most people in the U.S. don't practice these behaviors frequently or thoroughly enough. So, it's important to weigh very carefully the potential effects of restricting the choice of available sunscreens.

Some jurisdictions already restrict the sale of certain sunscreens because concerned advocates believe doing so will be good for the environment. In the U.S., they include [Hawaii, the U.S Virgin Islands and the city of Key West, Florida](#). Our report doesn't draw a definitive conclusion about whether these measures are scientifically justified or effective. Rather, it emphasizes analyzing whether and how they may affect human health as well as the environment.

The study draws attention to the challenge of understanding risks from UV filters to aquatic environments under various conditions, and in the context of overarching environmental stressors such as rising sea temperatures. It's important to understand that for both environmental and human health issues, laboratory studies don't always match what happens in the environment.

Studies of model systems such as bacteria and yeast, and organisms such as fish embryos and insect larvae, can yield findings that do not hold up in studies of humans. For both the environment and humans, it may not be possible or ethical to conduct true experiments that test the long-term effects of chemicals in UV filters.

Members of our committee wrestled to interpret the available evidence, and also with the gaps in that evidence. Ultimately, we concluded that the science is not settled, but that there is much to build on to advance understanding of this issue. Our conclusions are not a win/lose outcome for either the environment or humans. Rather, they point to a need to think both broadly and strategically for the benefit of people and the planet.

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Hawaii

Beginning on January 1 of this year the state of Hawaii enacted a sunscreen ban on the over-the-counter sale of those containing oxybenzone and octinoxate, and the state has more [legislation pending](#) to broaden the list of banned sunscreen ingredients. The law applies primarily to shops selling the products in the state, but visitors can take note by switching to a mineral sunscreen that aligns with the new move if they plan on bringing their own. The law has made Hawaii the first state in the U.S. to pass an official ban on the sale of certain sunscreens.

U.S. Virgin Islands

Hawaii likely drew some inspiration from the U.S. Virgin Islands, which has outright banned sunscreens containing oxybenzone, octoerylene, and octinoxate since March 2020. The island chain does not permit the sale or use of sunscreens containing any of those three ingredients. Its strict stance might have something to do with the fact that the island chain was one subject in a [years-long study](#) into the effects of chemical sunscreens on reefs, in which seawater taken from the popular Trunk Bay swimming spot in Virgin Islands National Park was found to have some of the highest concentrations of oxybenzone in the study.

Drug and Health Product Portal

Information on drugs and health products authorized by Health Canada.

Safety of sunscreens

In Canada, sunscreens are classified as non-prescription drugs or natural health products, depending on their active ingredients. They are regulated under the *Food and Drugs Act* and its *Regulations*.

All sunscreens approved for sale in Canada must have a Drug Identification Number (DIN) or Natural Product Number (NPN).

- Sunscreen products are authorized for sale in Canada to help prevent sunburns.
- There are currently over 1,600 authorized sunscreen products in Canada. All sunscreen products contain one or more active ingredients that offer protection from UV rays. Sunscreen products may contain chemical UV filters, physical UV filters, or both.
 - Chemical UV filters (e.g., avobenzone, homosalate, octocrylene, octisalate, octinoxate, or oxybenzone) work by absorbing UV radiation and converting it into a small amount of heat. These chemical UV filters are usually classified by Health Canada as drug ingredients and have an 8-digit Drug Identification Number (DIN) on the label of products that contain them.
 - Physical UV filters (e.g., zinc oxide and titanium dioxide) are mineral compounds that are believed to work by scattering and reflecting UV rays. These physical UV filters are usually classified by Health Canada as natural ingredients, and products containing only this type of UV filter have an 8-digit Natural Product Number (NPN) on the label.
 - Combination sunscreens that contain both chemical and physical UV filters have an 8-digit Drug Identification Number (DIN) on the label.