

Understanding how sunscreens damage coral

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You can love something to death. That is one way of thinking about a new Stanford University study that reveals how a common component of many sunscreens worn by coral reef-exploring tourists may hasten the demise of these endangered ecosystems. The surprising findings, published May 6 in *Science*, could help guide the development and

marketing of effective, coral-safe sunscreens.

"It would be a sad irony if ecotourism aimed at protecting [coral reefs](#) were actually exacerbating their decline," said study lead author Djordje Vuckovic, a Ph.D. student in civil and [environmental engineering](#). "My hope is that our research will help lead the way to developing coral-safe sunscreens."

Up to 6,000 tons of [sunscreen](#)—more than the weight of 50 blue whales—wash through U.S. reef areas every year, according to the [National Park Service](#). Scientists have known for some time that oxybenzone, an organic compound found in many sunscreens, can damage corals. As a result, sunscreens with this compound have been banned in the U.S. Virgin Islands and Hawaii, the island nation of Palau, and Bonaire, an island municipality of the Netherlands, among other places.

However, the mechanisms by which oxybenzone does harm have largely remained a mystery, making it difficult to ensure that sunscreen components proposed as alternatives are truly safer for corals.

William Mitch, a professor of civil and environmental engineering at Stanford, became interested in the issue several years ago when he heard about Hawaii's then-pending ban. With funding from the Stanford Woods Institute for the Environment, he and John Pringle, a professor of genetics in the Stanford School of Medicine, began work to characterize the chemical and biological mechanisms by which oxybenzone harms corals.

Protection for humans, damage for corals

In their new study, Mitch, Pringle, Vuckovic, and other Stanford researchers used anemones as surrogates for corals, which are harder to

experiment with, as well as mushroom corals. Exposed to oxybenzone in artificial seawater under simulated sunshine, the anemones all died within 17 days, whereas anemones exposed to oxybenzone in the absence of simulated sunlight remained viable.

"It was strange to see that oxybenzone made sunlight toxic for corals—the opposite of what it is supposed to do," said Mitch. "The compound is good at absorbing light within the waveband we tested, which is why it's so common in sunscreens."

After absorbing [ultraviolet light](#), oxybenzone is designed to dissipate the light energy as heat, preventing sunburn. The anemones and corals, however, metabolized oxybenzone in such a way that the resulting substance formed damaging radicals when exposed to sunlight.

In addition to this vulnerability, the researchers found evidence for a coral defense mechanism. Symbiotic algae in corals appeared to protect their hosts by sequestering within themselves the toxins that corals produced from oxybenzone.

As ocean waters warm, stressed corals expel their algae partners, exposing bone-white coral skeletons. Thus, in addition to being more vulnerable to disease and environmental shocks, such "bleached" corals would be more vulnerable to the depredations of oxybenzone without their algae to protect them.

Ensuring sunscreens are safe for corals and other marine species

Oxybenzone may not be the only sunscreen ingredient of concern, the researchers warn. The same [metabolic pathways](#) that appear to convert oxybenzone into a potent toxin for corals may do something similar with

other common sunscreen ingredients, many of which share similar chemical structures and so could form similar phototoxic metabolites.

Many sunscreens marketed as [coral](#)-safe are based on metals, such as zinc and titanium, rather than organic compounds, such as oxybenzone. Although these sunscreens are fundamentally different in how they function, it is not clear whether they are actually safer for corals, according to the researchers, who are planning to investigate the matter further.

"In [environmental science](#), as in medicine, a sound understanding of basic mechanisms should provide the best guidance for the development of practical solutions," said Pringle. "Our study also illustrates the enormous power of collaborations between scientists with very different backgrounds and expertise," said Mitch.

Co-authors of the study also include Amanda Tinoco, a research technician at Stanford School of Medicine at the time of the research; Lorraine Ling, a postdoctoral scholar in genetics at the time of the research; and Christian Renicke, a postdoctoral research scientist in genetics.

More information: Djordje Vuckovic et al, Conversion of oxybenzone sunscreen to phototoxic glucoside conjugates by sea anemones and corals, *Science* (2022). [DOI: 10.1126/science.abn2600](https://doi.org/10.1126/science.abn2600).
www.science.org/doi/10.1126/science.abn2600

Colleen M. Hansel, Sunscreens threaten coral survival, *Science* (2022). [DOI: 10.1126/science.abo4627](https://doi.org/10.1126/science.abo4627).
www.science.org/doi/10.1126/science.abo4627

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