Coral-friendly sunscreen shown to provide better UV protection than existing options

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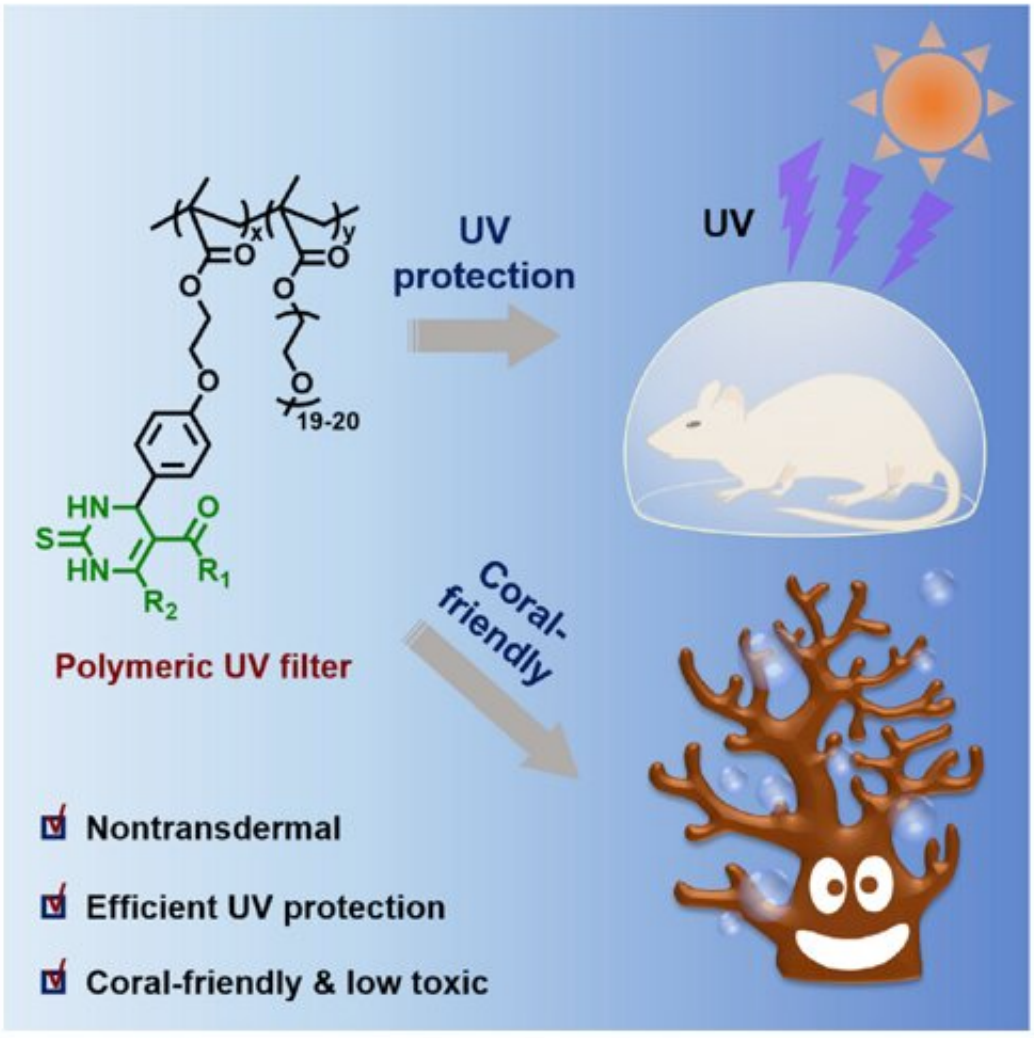

The new coral-friendly sunscreen and its properties. Credit: Zeng et al.

Researchers have developed a prototype for coral-reef-friendly sunscreens by using polymerization to create large molecules that still block UV radiation but are too big to penetrate our skin, coral, and algae. The polymeric UV filter, presented in the journal *Cell Reports Physical Sciences*, was more effective at preventing sunburn in mice than existing sunscreens.

"This is an initial exploration of a new strategy to design bio-friendly and coral-friendly polymeric UV filters," says senior author Lei Tao, a chemist at Tsinghua University. "We hope this leads to the next generation of sunscreens."

Tao was inspired to explore environmentally friendly sunscreens after visiting the Great Barrier Reef in 2010. "I was blown away by the beautiful coral, and ever since I learnt that sunscreen is one of the causes of coral bleaching, I kept thinking about ways to develop a coral-friendly sunscreen."

To do this, Tao's team first used a chemical reaction to randomly generate different ring-shaped molecules with similar structures to avobenzone, an existing UV filter. Then, they used a second chemical reaction to link these ring-shaped molecules together in different combinations, thus creating a suite of candidate polymers to choose from. The researchers zeroed-in on the best candidate by comparing the polymers' SPF value and capacity to absorb UV radiation.

When the researchers tested the winning polymer's ability to prevent UV-induced skin-burn in mice, they found that it was significantly superior to oxybenzone, avobenzone, and two commercial sunscreens. It was also safe: the mice did not absorb the polymer through their skin, nor did they experience any inflammation or other skin damage.

The polymer UV filter also appears to be non-hazardous for coral and

algae, two groups of organisms that are harmed by currently available chemical sunscreens. Chlorella algae was unaffected when the team grew it in the presence of small amounts of the polymer, as were two common types of coral. These same corals bleached and died within 6 and 20 days of exposure to oxybenzone, respectively.

One caveat of the UV filter is that it is not biodegradable due to the structure of its chemical backbone, but the researchers say that this is just the first step towards developing the next generation of environmentally safe UV filters.

"We have some ideas for other non-random polymerization methodologies that we could combine with the chemical group that we developed in this study to create an environmentally friendly and readily biodegradable UV filter," says Tao. "Meanwhile, we will try to work with companies to test the current polymer and see whether it can be used in sunscreens."

More information: Lei Tao, Coral-friendly and Nontransdermal Polymeric UV Filter via the Biginelli Reaction for In Vivo UV Protection, *Cell Reports Physical Science* (2023). DOI: 10.1016/j.xcrp.2023.101308. www.cell.com/cell-reports-phys … 2666-3864(23)00067-X

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