SCIENCE FOR ENVIRONMENT POLICY

A novel approach to monitor stress in corals exposed to emerging pollutants such as UV filters

18th November 2020 /
Issue 553

Subscribe to free bi-weekly News Alert.

Source:
Stien, D., Suzuki, M., Rodrigues, A. M. S., Yvin, M., Clergeaud, F., Thorel, E., and Lebaron, P. (2020) A unique approach to monitor stress in coral exposed to emerging pollutants. *Scientific Reports* 10: 9601.

Contact:
didier.stien@cnrs.fr

Coral reefs have been experiencing global decline attributed to human activity — including global warming, bottom trawling, overfishing and pollution. Certain UV filters, commonly found in sunscreens and cosmetics, are among the substances thought to have a potentially negative effect on corals. This study explores the effects of 10 UV filters on the coral *Pocillopora damicornis* under experimental conditions. The researchers identify a metabolomic 'signature' (i.e. a unique chemical 'fingerprint' created by specific cellular processes — whether in an entire organism, tissues or body cells) in corals and use this to deduce that three of the tested UV filters may trigger a coral stress response.

Coral decline is attributed to anthropogenic factors such as global warming, bottom trawling, overfishing and pollution. Research suggests that some types of solar (UV) filters, substances regularly released into the sea from populated or tourism-oriented coastal zones, may contribute to coral bleaching, including by facilitating viral infections, and have other detrimental effects on coral reefs. The negative effects of specific substances are increasingly being recognised, with Hawaii and the Republic of Palau being the first to restrict or prohibit the manufacturing, importation, or sale of sunscreens deemed toxic to reefs. Other ingredients in sunscreens and cosmetics may also exacerbate the toxicity of certain UV filters, highlighting the importance of understanding how corals respond to specific, and widespread, pollutants.

This study explored the impact of 10 UV filters on the coral *Pocillopora damicornis* using metabolomic profiling, a form of analysis that identifies and characterises small molecules left behind by the cellular process of metabolism (known as 'metabolites'). The studied UV filters belong to five compound classes — acrylates, benzotriazoles, phenones, salicylates and s-triazines — all permitted in the European Union as UV filters in cosmetic products.

European Commission

SCIENCE FOR ENVIRONMENT POLICY

A novel approach to monitor stress in corals exposed to emerging pollutants such as UV filters (continued)

Read more about:
Biodiversity, Chemicals, Emerging risks, Marine and coastal, Natural capital

To cite this article/service:
"Science for Environment Policy":
European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol..

Small fragments of *P. damicornis* were exposed to different UV filters over time at concentrations of between 5 and 2000 micrograms (µg) per litre (depending on the allowed maximum product concentrations and likely prevalence of each substance in the environment). The resulting metabolites were profiled to interpret the coral's response.

Compared to the control, exposed corals showed elevated concentrations of a particular steroid hormone — (3β, 5α,8α)-5,8-epidioxy-ergosta-6,24(28)-dien-3-ol, described as steroid '14' in the study — and exhibited what the researchers called a potential 'stress response' (increased production of specific lipids). In conclusion, this steroid hormone may mediate coral response to pollutants and the researchers, therefore, propose it as a potential marker for stress in corals. They highlight, however, that more investigation is needed to clarify its role.

Overall, three of the investigated UV filters appeared to affect the metabolic activity of the corals: octocrylene (OC), 2-ethylhexyl salicylate (ES) and benzophenone-3 (BP3). OC was the most toxic, eliciting high levels of steroid 14 and causing coral cell dysfunction at levels of 50 µg per litre. ES came second in terms of toxicity, triggering coral stress response at concentrations of 50 micrograms (µg) per litre, and possibly inducing partial coral bleaching (although the researchers note that this outcome requires further study). Lastly, at far higher concentrations of 2 000 µg per litre, BP3 also triggered an increase in levels of steroid 14 within exposed corals.

The research identified a metabolomic signature molecule, based on the metabolomic profiling of stressed corals — which may be valuable for EU policymakers and environmental managers in their efforts to characterise the health of the coral reefs in Europe's oceans and water bodies. As legislation evolves to promote more sustainable tourism, the researchers suggest it is key to evaluate the impact of UV filters on corals and to quantify coral response to pollutants, while also considering the public health benefits of sun protection.