



ENVIRONMENTAL HEALTH PERSPECTIVES

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**Roberto Danovaro, Lucia Bongiorno, Cinzia Corinaldesi,
Donato Giovannelli, Elisabetta Damiani, Paola Astolfi,
Lucedio Greci, Antonio Pusceddu**

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Sunscreens Cause Coral Bleaching by Promoting Viral Infections

Roberto Danovaro^{1*}, Lucia Bongiorno¹, Cinzia Corinaldesi¹, Donato Giovannelli¹,
Elisabetta Damiani², Paola Astolfi³, Lucedio Greci³, Antonio Pusceddu¹

¹Department of Marine Sciences, Polytechnic University of the Marche, Ancona, Italy

²Institute of Biochemistry, Polytechnic University of the Marche, Ancona, Italy

³Department of Chemical Sciences and Technologies, Faculty of Science,
Polytechnic University of the Marche, Ancona, Italy

Address of the Institution:

Polytechnic University of the Marche, Via Breccie Bianche, 60131 Ancona, Italy Tel:
+39-071-2204654; Fax: +39-071-2204650; r.danovaro@univpm.it;

Corresponding author:

Roberto Danovaro

Department of Marine Sciences, Faculty of Science, Polytechnic University of the
Marche, Via Breccie Bianche, 60131 Ancona, Italy.

Tel: +39-071-2204654; Fax: +39-071-2204650

E-mail: r.danovaro@univpm.it

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List of abbreviations:

BMDBM - 4-tertbutyl-4'-methoxydibenzoyl methane

BZ - 2-hydroxyl-4-methoxybenzophenone

CMYK- Cyan, Magenta, Yellow, black

EHS - 2-ethylhexyl salicylate

MBC - 4-methylbenzylidene camphor

OCT - 2-ethylhexyl 2-cyano-3,3-diphenylacrylate

OMC - 2-ethylhexyl-4 methoxycinnamate

PG - propylene glycol

TEM- transmission electron microscopy

UV - ultraviolet

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ABSTRACT

Background: Coral bleaching (i.e., the release of coral symbiotic zooxanthellae) has negative impacts on biodiversity and functioning of reef ecosystems and their production of goods and services. This increasing world-wide phenomenon is associated with temperature anomalies, high irradiance, pollution and bacterial diseases. Recently, it has been demonstrated that personal care products, including sunscreens, can have an impact on aquatic organisms similar to that of other contaminants.

Objectives: Evaluate the potential impact of sunscreen ingredients on hard corals and their symbiotic algae.

Methods: *In situ* and laboratory experiments were carried out in different tropical regions (the Atlantic, Indian and Pacific Oceans, and the Red Sea) by supplementing coral branches with aliquots of sunscreens and common ultraviolet filters contained in sunscreens formula. Zooxanthellae were checked for viral infection by epifluorescence and transmission electron microscopy analyses.

Results: Sunscreens cause the rapid and complete bleaching of hard corals, even at extremely low concentrations. The effect of sunscreens is due to organic UV filters, which are able to induce the lytic viral cycle in symbiotic zooxanthellae with latent infections.

Conclusions: We conclude that sunscreens, by promoting viral infection, can potentially play an important role in coral bleaching in areas prone to high levels of recreational use by humans.