Lotion in the Ocean: Sunscreens as Marine Pollutants

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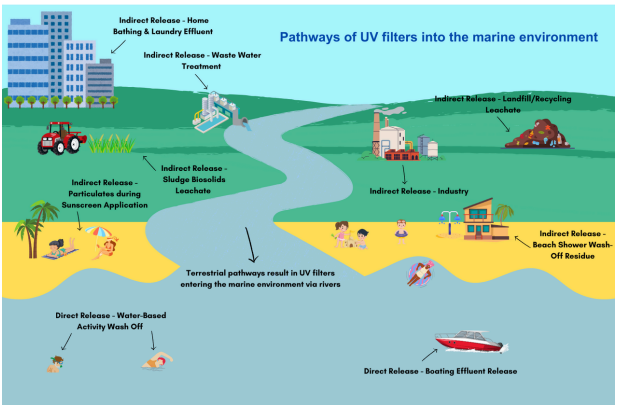
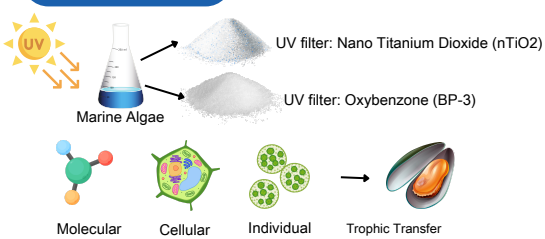
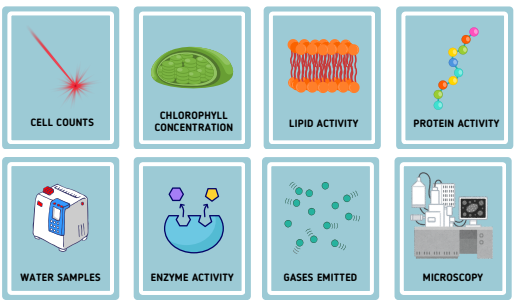
The Problem

- Sunscreens contain ultraviolet (UV) filters that block, absorb or reflect UV radiation
- A single beach with 1000 visitors is estimated to release up to 35kg of sunscreen[1]
- Current water treatment technologies do not have the capacity to remove most UV filters from effluent
- These compounds can have negative effects on marine organisms[2]
- UV filters banned in Hawaii, Palau and the U.S Virgin Islands due to their environmental harm are permitted under UK REACH and ECA



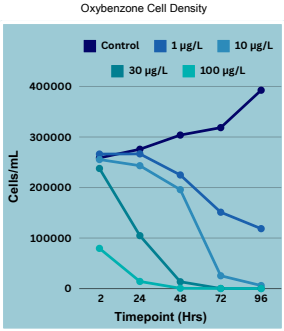
Our Approach





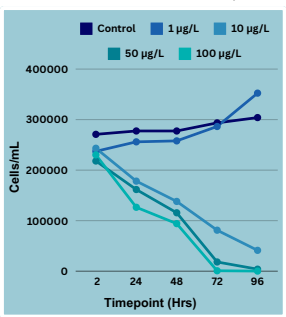
Our Findings

Oxybenzone Cell Density



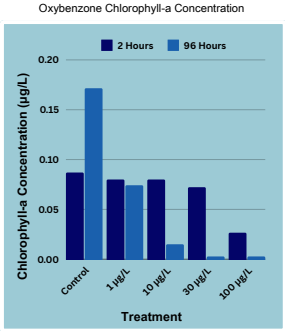
Cell density of algae (*Isochrysis galbana*) exposed to oxybenzone at various timepoints - showing 100 µg/L causes a significant decline in density within 2 hours.

Nano Titanium Dioxide Cell Density



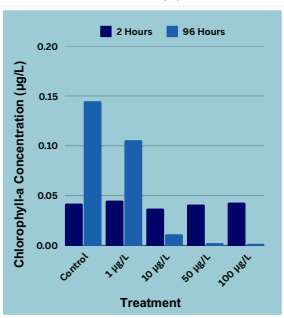
Cell density of algae (*Isochrysis galbana*) exposed to nano titanium dioxide at various timepoints - showing 10 µg/L causes a decline in density within 24 hours.

Oxybenzone Chlorophyll-a Concentration



Chlorophyll-a concentration of algae (*Isochrysis galbana*) exposed to oxybenzone at 2 and 96 hours - showing a significant decline in chlorophyll-a within 96 hours at 10 µg/L.

Nano Titanium Dioxide Chlorophyll-a Concentration



Chlorophyll-a concentration of algae (*Isochrysis galbana*) exposed to nano titanium dioxide at 2 and 96 hours - showing a significant decline in chlorophyll-a within 96 hours at 10 µg/L.

The Bottom Line

BP-3 and nTiO2 causes extreme decline in algae growth and chlorophyll-a concentration after short-term exposure to very low, environmentally relevant concentrations

Our research shows that nTiO2 can negatively impact marine organisms, contrast to several studies to date

Other mechanisms tested indicate towards nTiO2 impairing photosynthesis and BP-3 causing lipid, protein and enzymatic stress

Future work will compare the potential of inorganic and organic UV filters to transfer along the food-chain from algae to mussels

More research is required to understand which UV filters are safe for the marine environment, whilst providing effective sun protection to humans

SCAN ME

References: 1. Downs, C.A *et al.* (2022) Beach showers as sources of contamination for sunscreen pollution in marine protected areas and areas of intensive beach tourism in Hawaii, USA, *Journal of Hazardous Materials*, 438, pp. e129546, DOI: https://doi.org/10.1016/j.hazmat.2022.129546 2. Hodge, A.A *et al.* (2025) Ecotoxicological effects of sunscreen derived organic and inorganic UV filters on marine organisms: A critical review, *Marine Pollution Bulletin*, 213, pp. e117627, DOI: https://doi.org/10.1016/j.marpolbul.2025.117627