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Ocean vs Toxins:
Environmental Risks Related to the Usage of Commercial Sunscreens

According to the investigation held by Fortune Business Insight, **the amount of money spent on sun care products on the global scale was $13.03 billion in 2017**. This is expected to reach $16.84 billion by 2027 ("FBI"). This makes the production and retail of the sun care cosmetics a big and growing industry. This is not surprising, considering that wearing sunscreen is "proven to decrease the risk of skin cancers and skin precancers," according to the Skin Cancer Foundation.

Sunscreens protect you from the dangerous side effects of sun exposure, **however, do they come with any side effects**?

In this article, the potential risks of the usage of traditional commercial sunscreens will be discussed.

Before we start, it might help to briefly introduce two basic concepts, which are almost fundamental in environmental geochemistry.

These are **biomagnification and bioaccumulation.**

Both are **ways that toxins are accumulated in organisms and transferred through one to the other**. To put it simple, bioaccumulation takes place in a single organism over its lifespan, resulting in a higher concentration as it gets older. For example, fish are exposed to the mercury (the mercury ends up in the ocean either by volcanic eruptions, or more often by the burning of fossil fuels- performed by humans).

During the fish lifespan, the mercury that they are exposed to, will accumulate in them. **Therefore, for example, a younger tuna will contain less mercury than an older tuna.**

This brings us to the second term: biomagnification. **Biomagnification occurs as chemicals transfer from lower trophic levels to higher trophic levels within a food web**, resulting in a significantly higher concentration in apex predators. This natural phenomenon can be explained with a similar example: due to the aforementioned reasons, the **mercury concentration in the seawater is around 0.0003 ppm** (parts per million).

When clams and scallops filter the water for nutrients, they take up mercury, and in their system, this rate increases to 0.003 ppm.

When the scallion is eaten by a lobster, the main hunter of scallop, the concentration of mercury in the lobster becomes 0.107 ppm.

Monkfish love lobster, and because of this, they have a mercury concentration of 0.161 ppm. When a monkfish is eaten by one of the larger predators, such as tuna, the concentration is magnified in the system of tuna to 0.999 ppm.

This is why eating tuna (or larger fish in general) more than once a week is likely to lead to serious consequences in human health, and can lead to anywhere between heavy metal poisoning to death, or nervous system disruptions in the future offspring.

To understand the risks of using sunscreen, first we need to understand what is in it.

Sunscreen protects the skin from the UV (ultraviolet) irradiation by using some chemicals called UV- filters.

The UV-filters are organic compounds, and they either block or absorb the UV light.

While these organic compounds successfully reduce your chances of developing sun related complications, such as sun poisoning, severe skin damage related to burns, and developing skin cancer in the long term, they unfortunately do not stay on your skin forever, as the water of the ocean washes it off your body.

Following this, they mix with the water, and interact with the marine life.

This is where the actual problems begin to rise, as the environmental impact of these compounds might be a lot bigger than what most people can imagine.

The residue of the UV-filters is commonly reported to be found in seawater samples and even in the sea creatures.

Some of these commonly used UV-filters are 3-(4-methylbenzylidene-camphor) (4MBC), 2-ethyl-hexyl-4-trimethoxycinnamate (EHMC), benzophenone-3 (BP3) and benzophenone-4 (BP4).

A study conducted in 2010, published in the Marine Environmental Research Journal, examined the impact of these organic compounds on marine life. **They found out that these UV- filters negatively interact with the hormone system of fish, resulting in decreased fecundity and reproduction** (Fent et al.).

They also suggest that individual UV-filters should undergo further ecotoxicological analysis, as an environmental risk is big enough to be ruled out.

According to a recent article published by the National Oceanic and Atmospheric Administration of the United States of America, the environmental impacts go even further.

There are further UV-filters that are commonly used, such as octocrylene, benzophenone-1, benzophenone-8, OD-PABA, nano-Titanium dioxide, nano-Zinc oxide, octinoxate, and oxybenzone. These get bioaccumulated in various marine organisms other than fish, and **cause serious problems.**

For example, **they impair the growth of green algae and disturb their ability to photosynthesize.**

In corals, the bioaccumulation is fatal: these compounds accumulate in the tissues of corals and result in bleaching in mild cases, in moderate cases it can deform their DNA and young corals, and in severe cases it even kills them.

The aforementioned organic compounds also cause defects in younger mussels. Sea urchins get affected in a similar way, but on top of that, these toxins also damage their immune systems and reproductive systems.

In dolphins, bioaccumulation of these compounds in tissues are even transferred to babies in birth ("NOAA").

It is also possible that any of these toxins can be returned back to the systems of humans through biomagnification.

What can we do?

How can we stay healthy under the sun while not hurting the marine life?

There are some ways, of course.

- **First of all, we can consider using sunscreen without chemicals that can harm marine life and/or use natural alternatives.**

- It is also always safe to seek shade between 10 am & 2 pm
- and using Ultraviolet Protection Factor (UPF) clothing.
- If we have to use sunscreen, we can opt for a non-toxic one.

Unfortunately, there are not a lot of commercially available non-toxic sunscreens. **One of the very few cosmetics companies that produce this type of sunscreen is TAF UK trustee and creme award winner for 25 years; Daniele de Winther, in collaboration with TAF – The Animal Fund.**

They produce a sunscreen called "**Ocean Lover**" that is free from the toxins that are mentioned in this article and only made of organic oils and juices, which do not hurt the marine life.

They also share their ingredients on their website[1].

Moreover, the money you spend on the product goes to a non-profit charity that helps to protect the ocean and marine life.

Such products can be used, if you need to be under the sun, but staying in the shade during the period with direct sun exposure is the safest way.

Figure 1: Ocean Lovers

[1] https://theanimalfund.net/en/projects/suncreen-campaign/

Works Cited

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