The Side Effect of Sunscreen in Our Marine

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ABSTRACT. Sunscreen application is highly important. It can protect our skin from UV exposure and prevent skin cancer. Nowadays, the understanding of people regarding the benefit of sunscreen has been increasing. It shows from the research that sunscreen is the top of skincare habit. Many companies also offer more advantages such as creating combination of sunscreen with whitening or make-up coverage functions. It makes this product achieves raising in sales. Sunscreen is definitely necessary for swimmer. However, some researches tell that the chemicals in the product can be pollutant in our sea. Some materials as oxybenzone and octinoxate in chemical sunscreen can accelerate coral bleaching even killing the coral reef. Meanwhile physical sunscreen, known safer than chemical sunscreen, is actually also contained potentially dangerous materials for marine. The nano particles such as titanium dioxide and zinc oxide recently found that can destruct the coral reef. However, further study is recommended to understand how far the dangerous of physical sunscreen for the sea life. Therefore, the customers are encouraged to seek more information to know which sunscreen that outweighs advantages and consider some more environmental-friendly habit as using UV protection clothes or not swimming during the peak time of sun exposure**.**

Keywords: Chemical Sunscreen, Physical Sunscreen, oxybenzene, octinoxate, titanium dioxide, zinc oxide

1. INTRODUCTION

Sunscreen application is one of important skincare routine especially for Indonesian. In fact, it has become a habit that must be followed in order to protect the skin from sun exposure. Sunscreen may be considered as an investment in our health. The experts also tell that sunscreen can be used for protection of skin cancer. Besides the raising of people awareness towards the sunscreen usage, the product innovation also leads to the purchase decision. Many companies offer more valuable experience by adding the value to the product such as UV protection with whitening function or UV protection that gives instant coverage (Du Prey, 2023). Therefore, it affects to the raising of sunscreen market. According to ZAP beauty index (2023), UV protection product including sunscreen is one of most-searched product by Indonesian woman. Also, the average of local sunscreen market in Indonesia has been growing and keeps increasing in the future (ECHEMI,2019).

The chemical composition in sunscreen protects our skin from sun exposure. Technically, it blocks the ultraviolet B (UVB) rays that cause sunburn but had little effect on ultraviolet A rays (UVA) (Hanrahan, 2012). However, the chemical content of sunscreen that protects the skin damages marine life, particularly coral reefs (McCoshum, Schlarb, & Baum, 2016). Sunscreen applied to the body before swimming at the beach will be rinsed away by seawater, which is where substances dangerous to coral reef.. These two chemicals are Oxybenzone and Octinoxate. These compounds cause coral larvae and coral newborns to be deformed, damage coral DNA, cause abnormal bone formation, and accelerate coral bleaching. Coral reefs are home to a variety of marine species consequently, when coral reefs are harmed, marine species will lose their place to shelter (Hall, 2022).

Other chemicals that can be harmful for marine are 3-benzylidine camphor, 4-methylbenzylidene camphor, octocrylene, benzophenone-1, benzophenone-8, OD-PABA, nano-titanium dioxide, and nano-Zinc oxide. Those chemicals are not only dangerous for coral reef but also other life in the ocean (National Ocean Service, 2020).

2. LITERATURE REVIEW

There are two types of sunscreens which are organic and inorganic sunscreen. Organic sunscreen or usually called as chemical sunscreen is the product that uses mainly organic compounds such as oxybenzone and avobenzone which absorb UV and radiate it as the heat (Lippert *et al*,2021). Meanwhile, inorganic sunscreen or usually called as physical sunscreen is a product that uses inorganic minerals such as titanium dioxide and zinc oxide which reflects and scatters the UV from the skin surface (Hanrahan, 2012).

According to Hanrahan (2012), In term of safety, these types of sunscreens have been widely known and used by the market. So, both of products are safe. However, physical sunscreen is considerably less irritant and is recommended for children because of its inorganic materials. Meanwhile chemical sunscreen can affect to minor stinging and skin irritation. Additionally, recent studies found that chemical sunscreen can be harmful for sea life due to its materials. Two very popular substances contained in sunscreen are Oxybenzone and Octinoxate. Both of these substances have a bad impact on the body because they have the potential to disrupt hormones in the body (Miller, 2019). Not only that, Oxybenzone and Octinoxate are also very dangerous for marine life, such as a reproductive problem in fish, changes in the taste of fish, damage to sea urchins, and the last one which will be deeply discussed, it threats the existence of coral reefs. Coral reefs will be harmed by Oxybenzone and Octinoxate, which will also speed up coral bleaching, cause aberrant coral structure, and harm coral DNA (Smith, 2018). The pollution of seawater with these two dangerous substances causes an increase in temperature, so this is what causes coral reef bleaching to accelerate. Normally, coral reefs will bleach at temperatures above 30 degrees Celsius, but with this pollution, coral bleaching will occur below the normal temperature (Kingsland, 2022).

Hawaii is one place where the effects of sunscreen's Oxybenzone and Octinoxate on coral reefs may be seen. It has been proven that these chemicals have serious negative effects on the marine environment, including killing off young coral, accelerating coral bleaching, and harming the genetic makeup of coral and other marine life. These two compounds leaked into the ocean and damaged coral reefs in the Hawaiian Sea in an estimated 6,000 tons. The hazard of oxybenzone particularly has been clearly found in laboratory and in-situ studies (Wood, 2018). Oxybenzone concentrations on nearshore reefs around the world are commonly between 100 parts per trillion and 100 ppb well within the range of being a significant environmental threat (Downs,2016 *cit* Wood, 2018).

Due to this concern, on May 1, 2018, the government of Hawaii adopted a regulation that prohibited the distribution and sale of sunscreen products that included Oxybenzone and Octinoxate, Governor David Ige's signature on the bill would make it operative on January 1, 2021 (Smith, 2018).

Apart from the research and treatment that has been carried out in Hawaii. There was also research conducted in Quintana Roo regarding the contamination of water with sunscreen. There were 2646.43 tons of sunscreen detected contaminating seawater from 2007 to 2019. With an average of 229.76 ± 51.62 tons per year.

Then, the study estimated that approximately 4367.25 tons of chemicals from sunscreen will be detected entering the ocean waters. It is an estimate of the total number from 2007 to 2025 (Beltran, Pedraza, & Flores, 2020). If the estimated conditions occur, more Oxybenzone and Octinoxate will be mixed into seawater in Quintana Roo.

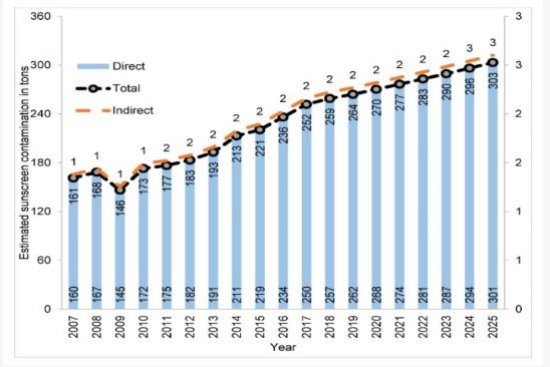

Figure 1. Direct, indirect, and total estimated sunscreen contamination of the karst aquifer in Quintana Roo, Mexico 2025 (Beltran, Pedraza, & Flores, 2020).

Physical sunscreen is promoted as safer sunscreen for the ocean. However, the newest study tells that physical sunscreen also might affect to the abnormality of embryonic development and increase the rates of embryo mortality in zebrafish (Haningan *et al,* 2018 *cit* Lippert *et al* 2021). Additionally, zinc oxide in physical sunscreen may induce coral bleaching too (Haningan *et al,* 2018 *cit* Lippert *et al* 2021). According to Yuan *et al* (2023), the physical sunscreen induced severe

growth inhibition effects in coral *Zoanthus sp* through oxidation. Basically, nanoparticles in physical sunscreen such as Titanium dioxide and Zinc oxide are potentially hazardous but the researches mainly have been being conducted in laboratory that might be different with marine condition (Hanna *et al*, 2013 *cit* Wood, 2018).

3. CONCLUSION & RECOMMENDATION

Sunscreen is a beneficial skincare that can protect our skin from UV and it also may prevent people from skin cancer. However, the chemical ingredients in sunscreen both chemical and physical sunscreen may affect to the harm of marine life especially coral reef. The chemicals are known that might bleach the coral reef. Oxybenzone, one of chemicals in chemical sunscreen, is widely proven dangerous for marine environment. The nano particles in physical sunscreen such as titanium dioxide and Zinc oxide are also potentially harmful based on laboratory study but more research is recommended.

Further literature review and research especially regarding the hazard of physical sunscreen are highly recommended to seek which sunscreen that outweighs advantages. People can consider to use sunscreen that is less harmful and consider to seek shade between 10 am to 2 pm, protect themselves by using UV protection clothes, sunglasses, and umbrella.

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