The Effect of Octocrylene and Octisalate Sunscreen on the Mortality Rate, Shell Color and Weight of Clams

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Abstract

Sunscreen products, including those containing Octocrylene and Octisalate, have raised concerns regarding their impact on aquatic ecosystems. Some studies suggest that certain chemicals commonly found in sunscreens, such as oxybenzone and octinoxate, can have adverse effects on marine organisms, including corals and fish. While Octocrylene and Octisalate are different from oxybenzone and octinoxate, it's important to consider the potential for environmental impact. Research on the effects of these specific sunscreen ingredients on clams or other marine life might be limited. This study showed that there was a significant impact of the chemicals Octocrylene and Octisalate on the weight loss, discoloration, texture change and LD 50 of the clams. The exposure of 20 dips of the said chemicals showed a significant decrease in weight and also the chemicals showed over 75% death of clams in all concentrations of the chemicals.

Introduction

Octocrylene and octisalate are organic compounds commonly used in sunscreens to provide UV protection. Octocrylene primarily acts as a UVB filter, while octisalate functions as a UVB absorber. When combined in sunscreen formulations, they contribute to broad-spectrum coverage against both UVA and UVB rays, thereby helping to prevent sunburn and potential long-term skin damage. Octocrylene, due to its ability to absorb UVB rays, plays a crucial role in protecting the skin from the harmful effects of the sun. It is known for its photo stabilizing properties, which enhance the overall effectiveness of the sunscreen formulation. Octisalate, on the other hand, is an ester of salicylic acid that absorbs UVB radiation. It is often used in combination with other sunscreen agents to achieve a balanced and comprehensive UV protection profile. When applied topically, sunscreens containing octocrylene and octisalate are generally considered safe for use in protecting the skin from sun exposure. These compounds are well-tolerated by most individuals and are commonly found in a variety of sun care products, including lotions, creams, and sprays. However, it's important to note that some individuals may have sensitivities or allergies to certain sunscreen ingredients. In such cases, it is advisable to perform a patch test or consult with a healthcare professional to identify suitable alternatives. Additionally, it's crucial to follow the recommended application guidelines, reapply sunscreen as needed, and take other sun protection measures, such as wearing protective clothing and seeking shade, to minimize the risk of sun-related skin damage. Ongoing research addresses the environmental impact of sunscreen ingredients, highlighting the importance of using reef-friendly options. Staying informed about scientific advancements and regulatory updates ensures a comprehensive understanding of sunscreen benefits and considerations, emphasizing adherence to product guidelines and seeking professional skincare advice.

Materials and Procedures

To conduct the experiment, obtain ten 250mL beakers and label them from one to ten. Designate beaker number 1 as the control, beakers 2-4 for 10 dips, beakers 5-7 for 20 dips, and beakers 8-10 for 30 dips. In each beaker, add 100 ml of sand and 100 ml of sea saltwater (prepared with 35 grams of salt per 1000 ml of water) for the clams' habitat. Weigh 10 sets of 5 clams and record their weights in a data table. Capture images of all clams. Place one set of 5 clams into each beaker, matching the numbers accordingly. Prepare ten leather pieces measuring 2.5x3.5 inches, each attached with strings no longer than three inches. Label these leather pieces from 1 to 10. Spray sunscreen on both sides of leathers 2-10 for 3 seconds, while leather 1 remains the control with no sunscreen application. Allow the leather pieces to air dry for exactly 5 minutes. Hold leather one by the string and dip it into the beaker one ten times, with each dip lasting 2 seconds. Repeat this process for the remaining leather pieces, matching the numbers, but dip leathers 20 times for beakers 5-7 and 30 times for beakers 8-10. After completing the dips, wait for 7 days and collect data daily, noting which clam died in each beaker. This experimental design will help assess the impact of sunscreen exposure on clams and their shells over time. You will have to gather certain materials. This includes 35 g of salt dissolved in 1000 ml of water within one of the six beakers. Prepare a safety pin, a sheet of leather cut into ten pieces, and two bottles of sunscreen—one with octisalate and the other with octocrylene. Additionally, collect 50 clam shells, a weight scale, a camera for documentation, paper for recording data, a marker for labeling, and tape for securing the leather strips. The experiment aims to investigate potential impacts on clam shells through controlled exposure, with different beakers representing various sunscreen applications and controls. The systematic use of these materials will facilitate the observation and documentation of any changes in clam shell characteristics throughout the experiment.

Results

See pages 80-81.

Discussion

The above data suggests that Octocrylene and Octisalate along with Oxybenzone is also harmful to marine life and are participants

	Weights of Clams Before the Experiment						Weights of Clams After the Experiment					
	C1 Before	C2 Before	C3 Before	C4 Before	C5 Before	Mean	C1 After	C2 After	C3 After	C4 After	C5 After	Mean
Control	0.373g	0.278g	0.273g	0.265g	0.256g	0.292g	0.375	0.216	0.321	0.197	0.234	0.2688
10D T1	0.238	0.379	0.249	0.379	0.182		0.225	0.306	0.226	0.345	0.293	
10D T2	0.341	0.299	0.218	0.257	0.214	0.271	0.341	0.241	0.254	0.18	0.175	0.269
10D T3	0.341	0.299	0.214	0.257	0.218		0.333	0.216	0.241	0.325	0.243	
20D T1	0.354	0.304	0.255	0.374	0.327		0.211	0.302	0.173	0.244	0.169	
20D T2	0.216	0.312	0.241	0.355	0.199	0.272	0.282	0.183	0.213	0.174	0.268	0.234
20D T3	0.195	0.232	0.326	0.242	0.165		0.215	0.183	0.279	0.371	0.251	
30D T1	0.369	0.159	0.218	0.258	0.179		0.178	0.173	0.209	0.324	0.176	
30D T2	0.125	0.294	0.241	0.338	0.177	0.257	0.401	0.255	0.292	0.308	0.239	0.245
30 D T3	0.448	0.340	0.301	0.229	0.185		0.311	0.243	0.251	0.171	0.183	

Table 1. The weights of all the clam shells were around 0.2-0.4 grams before the experiment and after the experiment the weights decreased to around 0.1g to 0.3g.

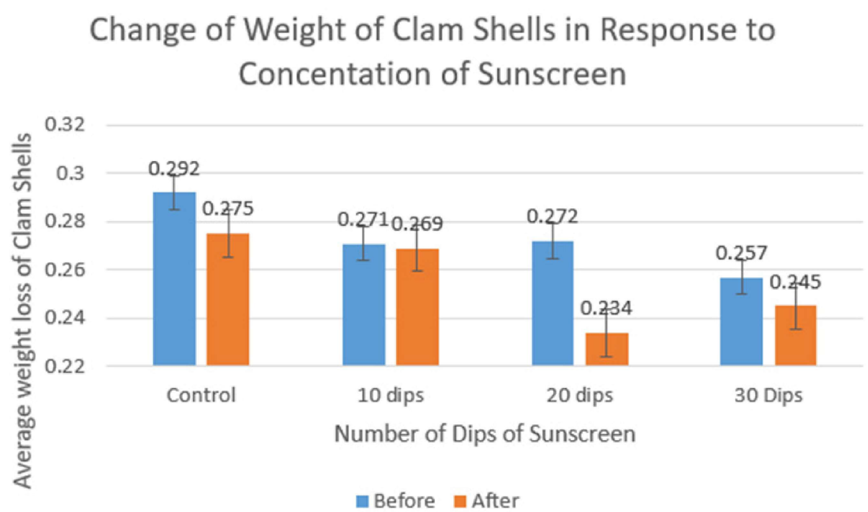

Fig. 1. Shows the total weight loss of the clam shells before and after the experiment

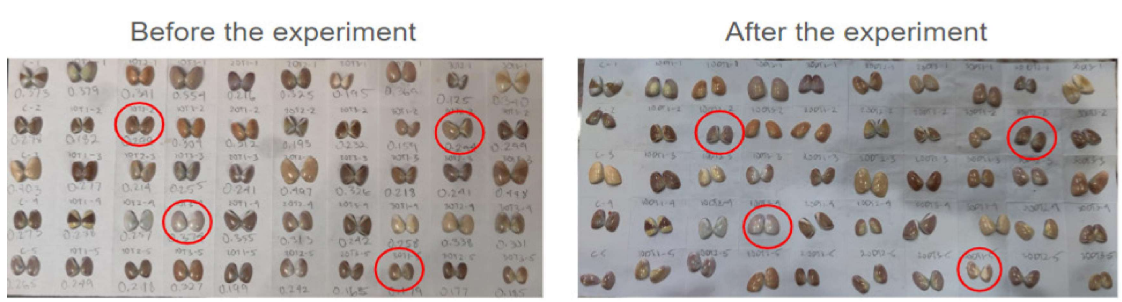

Fig. 2A and 2B: The two images show the shells organized in a paper and the differential coloration of before and after the exposure to chemicals. The highlighted shells between the two (before and after) pictures shows very obvious changes in coloration and texture, while all the others showed changes as well.

	Mortality Rate of the Shells									
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total	Avg
Trials	Control	0	0	0	0	0	1	0	1	1
	10 Dips Trial 1	0	0	1	1	0	1	0	3	
	10 Dips Trial 2	0	0	1	0	1	1	0	3	3
	10 Dips Trial 3	0	0	1	0	1	1	0	3	
	20 Dips Trial 1	0	0	0	2	0	0	0	2	
	20 Dips Trial 2	0	0	2	0	0	0	0	2	2.333
	20 Dips Trial 3	0	0	0	2	0	0	1	3	
	30 Dips Trial 1	0	1	0	2	0	0	0	3	
	30 Dips Trial 2	0	0	0	0	3	0	1	4	3.667
	30 Dips Trial 3	0	0	0	1	2	1	0	4	

Table 2: Shows the number of clam mortality showing the LD50 to be as low as 10 dips of the chemicals. Each treatment had 3 replicates with 4 clams in each container.

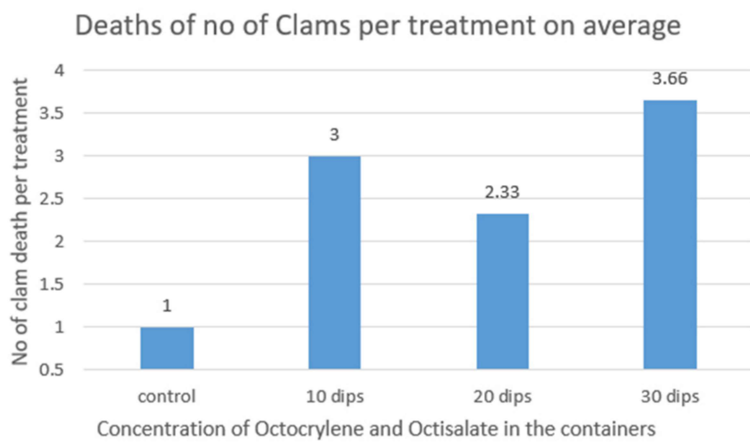

Fig. 3. Shows the number of clams that died on average per treatment. The numbers are in decimals because it is an average of the total number of clams that died across the three replicates we had with 4 clams in each container.

in coral bleaching and marine life loss along with Oxybenzone. The data shows that with the increase in concentration of the chemicals, the shell weight decreased considerably in the 20 dips of the chemical(-0.034 g) in comparison to the others. The LD 50 (table 3) shows a mortality rate at 10 dips of the chemicals and increases with increase in concentration of the chemicals. Changes in coloration and texture also follow the same trends.

Conclusion

In conclusion, the impact of octocrylene and octisalate on coral reefs has become a subject of environmental concern. Research suggests that these sunscreen ingredients, commonly used for their UV-absorbing properties, may pose a threat to coral ecosystems. Studies indicate that certain concentrations of octocrylene and octisalate can contribute to coral bleaching, hinder coral development, and potentially disrupt the delicate balance of marine life. As a result, there is a growing push for the use of reef-friendly sunscreens that exclude or minimize these chemicals, promoting the health and resilience of coral reefs. Sustainable alternatives and increased awareness regarding the potential environmental consequences of sunscreen use are essential for preserving the biodiversity and ecological integrity of these vital marine ecosystems. In light of these findings, ongoing research and proactive measures in sun care product development and consumer education are crucial for mitigating the impact of sunscreen ingredients on coral reefs.

References

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