How Well Are You Protected?

Science
Grades 1-8

Overview

Investigate the ability of different materials and substances to block the sun's UV rays.

In this activity, students use sun sensitive paper to compare the effectiveness of different materials and types of sunscreen. Through this activity, they determine if alternatives that are less harmful to marine life are as effective as chemical-based sunscreens.

Sunlight is required for part of this activity. This part can be completed outside or possibly indoors if there is access to direct sunlight. If you are conducting the activities indoors, test the activity ahead of time as some windows filter the sunlight.

Background

Sunscreen is part of our everyday life, but now scientists are discovering that some of the chemicals used in sunscreen formulations are harming the animals that live in the water. It washes off our bodies when we get into the water. When we take showers, the chemicals in sunscreen can travel through waste water and be carried out to sea, because water treatment plants do not usually remove these chemicals.[1]

Objectives

Students will learn that there are different options for sun protection and many of them are similar in effectiveness.

Learn More

- "Lathering Up With Sunscreen May Protect Against Cancer – Killing Coral Reefs Worldwide" (https://today.ucf.edu/lathering-up-with-sunscreen-may-protect-against-cancer-killing-coral-reefs-worldwide/)
- "Sunscreen Pollution" (http://www.alertdiver.com/Sunscreen-Pollution)
- "Why Hawaii Is Trying to Ban A Common Sunscreen" (http://www.popsci.com/hawaii-sunscreen-ban-coral)
- "Looking for a Reef-Safe Sunscreen? Ask a Surfer" (http://www.cntraveler.com/story/looking-for-a-reef-safe-sunscreen-ask-a-surfer)
- Danovaro, Roberto et al. "Sunscreens Cause Coral Bleaching by Promoting Viral Infections." *Environmental Health Perspectives*; 16.4, Apr 2008, pp. 441-7.
- Haereticus Environmental Laboratory (http://www.haereticus-lab.org/)

Materials

- Sun sensitive paper (we used Sunprint Paper from http://www.sunprints.org) (1 sheet per student)
- Chipboard or cardboard cut to the same size as the sun sensitive paper (1 per student)
- Cotton swabs (1 per student)
- Pencils (1 per student)
- Plastic document sleeves (1 per student)
- Shapes cut out of ultraviolet protection factor (UPF) rash guard (available in the swimwear sections of stores that carry sporting goods) material (1 per student)
- Shapes cut out of t-shirt fabric (1 per student)
- Spray bottle filled with water (4-6 students can share)
- Small bowl filled with non-nano mineral-based sunscreen (4-6 students can share) (Look for sunscreens that are labeled "non-nano" or sunscreens containing zinc or titanium that are not labeled as "clear")
- Small bowl filled with chemical-based sunscreen (4-6 students can share)
- Trays of water (students can share depending upon the size of the tray)
- Spray bottles filled with a lemon juice and water solution for cleanup
- Cloth for clean up

ReefLove is a public awareness campaign to spread the word about damage to marine life caused by chemical-based sunscreen and reef-friendly alternatives for sun protection. Special thanks to Dr. C. Anna Toline with the U.S. National Park Service (NPS) and Dr. Cheryl Woodley with the U.S. National Oceanic and Atmospheric Administration (NOAA).

ReefLove is a Girl Scout Gold Award project

[1] "Sunscreen Chemical Threatens Coral Reefs". http://oceanservice.noaa.gov/news/feb14/sunscreen.html

Pre-class Set Up

Important Note: Keep the sun sensitive paper out of the direct sunlight until you are ready to conduct the experiment.

Before class begins, place the following on each group table:

- Small bowl filled with mineral-based sunscreen (containing non-nano zinc or titanium oxide)
- Small bowl filled with chemical-based sunscreen (containing avobenzone, oxybenzone, octisalate, homosalte, or octinoxate)
- Spray bottle containing water
- Water trays out of direct sunlight, but near exposure location

Distribute the following to each student:

- Sun sensitive paper
- Plastic document sleeve
- Chipboard or cardboard
- Pencil
- Cotton swab
- Shape cut out of t-shirt material
- Shape cut out of rash guard material

Instructions for Students

1. Write one of the following letters in each corner of your sun sensitive paper:
   - R
   - T
   - C
   - M

   to indicate “rash guard”, “t-shirt”, “chemical sunscreen”, and “mineral sunscreen”.
2. Place the cardboard behind the sun sensitive paper to provide a sturdy backing. Insert both pieces into a plastic document sleeve with the sun sensitive paper visible through the plastic. You may want to use binder clips to secure the plastic binder sleeve contents and keep them from moving.
3. Lay the plastic document sleeve on the table so that the sun sensitive paper is visible through the plastic.
4. Place the t-shirt material shape on the plastic document sleeve near the “T” label. Note: You may need to spray the shape to dampen it so that it will lay flat.
5. Repeat for the rash guard material shape, placing it near the “R” label.
6. Dip one end of the cotton swab into the mineral sunscreen. Using the cotton swab, write an “M” on the plastic document sleeve near the “M” label. *Note: Do not mix the cotton swabs. Keep the chemical sunscreen separate from the mineral sunscreen. You may want to use different colored cotton swabs with matching colored bowls for the sunscreen.*
7. Dip the other end of the cotton swab into the chemical sunscreen. Using the cotton swab, write a “C” on the plastic document sleeve near the “C” label. Be sure that you leave some of the paper uncovered as your “control” (the part of the paper that will be fully exposed).
8. Take the plastic document sleeve packet to an area with direct sunlight until the unprotected or uncovered part of the paper turns white. Typically, this takes about four minutes.
9. Remove sun sensitive paper from the plastic document sleeve being careful not to get either type of sunscreen on the paper. Quickly immerse the paper in the water tray for approximately one minute. This will set the patterns from the sun exposure.
10. Lay the paper on a flat surface to dry.

Clean up

Activity helpers should collect the plastic document sleeves, spray them with the lemon and water solution and then wipe them with a cloth. The containers of zinc sunscreen may be washed out in the sink. Spray the containers of chemical sunscreen with the lemon and water solution and wipe them out, discarding the excess, to remove as much as possible before rinsing in the sink because the chemicals in sunscreen are not removed during most water supply treatment.

Visit www.reeflove.org for more information, ideas, and activities!