

UV DETECTIVES



Background Information for Activity Leaders

Overview

Children will explore the effects of ultraviolet radiation using ultraviolet light detecting beads.

Key Concepts

- The Sun’s energy reaches the Earth in the form of heat and light. **Ultraviolet (UV)** radiation is invisible to our eyes.
- Fortunately for life on Earth, the **Earth’s atmosphere** screens out most harmful UV radiation. However, what gets through can cause a number of problems, such as sunburns, especially for people who spend most of their time outdoors.
- A **sunburn** is one of the bad effects of too much ultraviolet (UV) radiation. Too many UV rays can cause more serious health effects, such as skin cancer, older-looking skin and other skin problems, and eye damage.
- Frequent sun exposure and sunburn in childhood set the stage for high rates of skin cancer later in life. People don’t realize that they can die from certain forms of skin cancer.
- A child’s skin is thinner and more sensitive. Even a short time outdoors in the midday sun can result in serious burns.
- Children love playing outdoors, but usually are not aware of the harmful effects of UV radiation. Estimates suggest that up to 80 percent of a person’s lifetime exposure to UV is received before the age of 18. Scientific studies suggest a link between early Sun exposure and skin cancer as an adult.
- Some **sunscreens** protect us from the two types of UV radiation: **UV-A** and **UV-B**. Both UV-A and UV-B cause sunburns and other damaging effects such as skin cancer. Sunscreen lotions, oils, and creams have different Sun Protection Factor (SPF) ratings. The higher the SPF, the more protection the sunscreen will provide against UV-B rays. SPF does not measure UV-A. If you are looking for UV-A protection, purchase a product that is labeled “broad-spectrum” protection.

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- The UV-sensitive beads contain a pigment that changes color when exposed to ultraviolet radiation from the sun. The beads are not affected by light from light bulbs because bulbs do not emit ultraviolet light. The beads will remain white indoors, as long as they are shielded from sunlight.
- The Environmental Protection Agency's SunWise program provides free resources for schools, families and children, in English and Spanish. You can learn more, download, and order materials at:

<http://www.epa.gov/sunwise>

- The National Weather Service and EPA provide daily updates about UV radiation levels in the US, by zip code. The UV Index predicts the next day's ultraviolet radiation levels on a 1 to 11+ scale, helping people determine appropriate sun-protective behaviors. The EPA issues a UV Alert when the level of solar UV radiation is predicted to be unusually high, and consequently the risk of over-exposure is greater.
- You can find out your area's UV radiation level at the following web site:

<https://www.epa.gov/sunsafety/uv-index-applications>

What to Expect

- The beads only change from white to various colors when exposed to ultraviolet light (sunlight). Prior to the activity, keep them away from any direct sunlight that might come into the room through doors and windows
- The beads are very sensitive. They will always change color, regardless of how well the sunscreen blocks the UV rays. Children will have to rate the color of the beads on a scale of 1-5, with 5 indicating the most color change, and 1 indicating the least color change.

Common Misconceptions

- *Children may think: "You can't get a sunburn through a window."*

A window acts like a sunscreen. It does not block all the UV radiation, but it does block the most dangerous wavelengths of UV radiation. This is why you will burn much more quickly when driving in a car with the windows down than with the windows up.

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- *Children may think: "It's healthy to have a good tan."*

A tan results from the body defending itself against further damage from UV radiation. A tan does provide some protection to the body, but a tan is a sign that skin is already damaged. It is not healthy. Sunburns greatly increase the risk of skin cancer, wrinkles, and leathery skin later in life.

- *Children may think: "You can't get a sunburn as quickly on a cloudy day as on a sunny day."*

Most people think that you can't get a sunburn on a cloudy day because they don't see sunshine and assume the UV rays are not coming through the clouds. On an overcast day, especially an overcast, rainy day, the amount of ultraviolet rays reaching the Earth are significantly reduced. However even on overcast days, 30 to 60 percent of the Sun's rays can penetrate to the Earth's surface.

Partly cloudy conditions do NOT reduce the sunburn risk by very much. Some people, however, make the mistake of staying outside longer when there is cloud cover and get a sunburn.

- *Children may think: "All clothing protects you 100% from UV radiation."*

Very lightweight fabrics with an open structure, such as very light woven cottons, do not offer very much protection from UV radiation. A heavier fabric with a closed structure, such as a knitted fabric, offers more protection. Color can also influence the amount of UV protection as different dyes absorb UV rays to different extents.

- *Children may think: "Only fair-skinned people can get sunburns."*

People of all skin colors can get sunburns. People of darker skin colors do have more protection from the UV radiation. One of the worst consequences of sunburns is skin cancer. All people however can suffer the consequences of over-exposure to UV radiation.

UV DETECTIVES



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Data Collection Sheet

Name: _____

Date: _____

WONDER Why do you think it's important to use sunscreen when you spend a lot of time outdoors?

.....

RECORD Rate the amount of color change observed after exposing the UV detecting beads to the sun for 5 minutes.

sun block name and SPF level	amount of UV radiation absorbed				
	least color change	~~~~~			most color change
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

CONCLUDE What did you discover about the SPF in each sunblock?

Set Up the Expedition

Materials

For the activity leader:

- (1) sun hat
- (1) pair of sun glasses
- **UV Detectives** Learning Cards

For each group:

- (3) clear plastic sandwich bags
- (30) UV detecting beads
- (3) sunblock lotions with different SPF levels
- (1) stop watch
- crayons, markers
- paper towels

For each child:

- (1) **UV Detectives** Data Collection Sheet
- (1) sheet of poster board

Prepare the demonstration:

1. Place the sun hat, the sunglasses, and one of the sun block lotions on the table where you will conduct the demonstration.

Prepare the exploration:

1. Seal 10 UV beads in each bag using packing tape. Make enough bags so that each station or group has 3 bags.
2. Identify a large, sunny area outside that has enough space for groups to spread out.
3. Place three samples of sunblock lotions, each with a different SPF level, at each group station.

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Activity Leader's Guide

Group Size: 3-4 children

Time: 45 minutes

Engage

- 1** Gather the children together. Put on a hat, sunglasses, and pretend to apply sunblock lotion.

Ask:

“What do these objects I’m using have in common?” Allow children to contribute different ideas about what these objects have in common. They all protect the skin from the Sun.

Say:

“The Sun’s rays contain ultraviolet, or UV radiation. UV radiation is one kind of energy that the Sun produces.”

- 2** **Ask:**

“What happens when you stay out in the sun without proper protection?” People can develop sunburn, skin cancer, and eye damage.

Say:

“These problems are caused by UV radiation. The good news is that you can prevent UV radiation from hurting you. You need to start practicing proper sun-safe habits while you are young. What are some examples of good sun-safe habits?” Allow children time to suggest good sun-safe practices, including: staying out of the sun during midday, wearing a hat, using protective sun glasses, wearing sun block, and wearing long sleeve loose-fitting clothes when spending a long time in the sun.

Explore/Expand

- 3** Distribute the Data Collection Sheets and the Learning Cards.

Say :

“Today we are going to learn more about one of the ways we can stay safe from the Sun’s UV rays. Sunscreen lotions, oils, and creams have different Sun Protection Factor (SPF) ratings. Follow the instructions on your Learning Card to test each kind of sunscreen by using UV detecting beads.” Explain to the children that the beads only change from white to various colors when exposed to ultraviolet light (sunlight). The beads are very sensitive. They will always change color, regardless of how good the sunscreen blocks UV rays. The children will rate the color of the beads on a scale of 1-5, with 5 showing the most color change and 1 showing the least color change.

- 4** Allow children enough time to complete the WONDER, EXPLORE, RECORD, EXPAND and CONCLUDE sections of their Learning Card.

During the EXPLORE section, children will take their covered bags of beads outside to a sunny area to conduct their investigation.

Conclude

- 5** Gather the children together and ask the following questions:

Ask:

“How well did each of the different SPF sunblock lotions protect the beads from UV radiation?”

Encourage children to discuss their results.

Ask:

“What do your results tell you about the level of protection that each sunblock provides?”

Encourage children to discuss what they noticed.

- 6** **Say:**
“Now, who would like to show us their poster and tell us about it?”

Encourage each child to share and describe their poster.

- 7** **Say:**
“Congratulations! You have earned your ‘Ask Me About the Sun’ stamp. You are ready to tell people about solar energy.”

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Expedition Learning Card

? How can ultraviolet light be detected?

 ultraviolet (UV) filter SPF

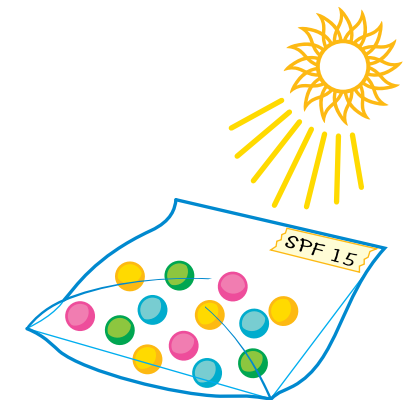
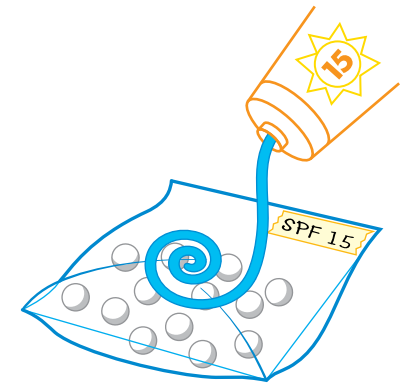
 Explore the effects of ultraviolet sunlight.

1 WONDER

 Record your ideas on your Data Collection Sheet.

2 **EXPLORE** Discover how different levels of SPF protection differ.

1. Place a piece of packing tape on the right hand corner of each bag.
2. Label the tape with the name of the sun block you will use on that bag.
3. Cover the outside of each of the three bags containing beads with a thin layer of sun block. Be sure to use the right sun block on each bag!
4. Cover the bags of beads with a piece of construction paper as you walk outside. Remove the construction paper and expose all of the bags to the sun for 60 seconds.
5. Rate the color of the beads on a scale of 1-5, with 5 showing the darkest color or "sunburn," and 1 showing the lightest color.



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Expedition Learning Card

3 RECORD What color changes did you notice in the beads in each bag?

 Draw or write on your Data Collection Sheet what you observe.

4 EXPAND Think about what you could tell your friends and family about UV rays, sunscreen, and the importance of being protected from UV radiation. If you have access to the Internet, learn more about UV sunlight at:

<http://www.epa.gov/sunwise>

 Create a poster to help your friends and family learn more about UV sunlight and how to stay safe in the sun. Share it with your class.

5 CONCLUDE What did you discover about the SPF in each sun block? What changes do you think you'll make to stay safe in the sun?

Discovery

Why did we do that?

- Sunscreen lotions have different SPF numbers.
- A higher SPF number protects you longer.
- UV radiation can cause sunburn, cancer, and skin and eye problems.
- Always wear some type of protection when out in the sun.

Congratulations!

You have earned your "Ask Me About the Sun" stamp! Now you are ready to tell people about solar energy!

