

# Myths and Facts about Sun Protection in Pediatric Population

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Welcome to “Myths and Facts about Sun Protection in Pediatric Population”, a podcast made for PedsCases.com at the University of Alberta. I am Dr. Harry Liu, a dermatology resident at the University of British Columbia, and I am Jennifer Ling, a fourth-year medical student at the University of British Columbia. This podcast will talk about different methods of sun protection in the pediatric population and we hope to present evidenced based recommendations on sun protection that you can share with patients. We would like to thank Dr. Miriam Weinstein and Dr. Conor Mulholland for developing this podcast with us. Dr. Weinstein is a pediatric dermatologist in Toronto at the Hospital for Sick Children (SickKids). Dr. Mulholland is a pediatric ophthalmologist at the BC Children’s Hospital in Vancouver. This podcast will be followed by another one that will discuss about pigmented skin and eye lesions as well as cutaneous and ocular melanoma in the pediatric population.

## Learning Objectives

1. Describe the properties of UV light and its effects on the skin and eyes
2. List different methods of sun protection
3. Discuss how to effectively educate patients about sun protection
4. Outline the initial steps in managing a sunburn  
(there was no financial support or any conflict of interests for the development of this podcast)

After listening to this podcast, we expect the learner to be able to:

- Describe the properties of UV light and its effects on the skin and eyes
  - List different methods of sun protection
  - Discuss how to effectively educate patients about sun protection
  - Outline the initial steps in managing a sunburn
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## Case of Lucy

- ID: Lucy (a 16-year-old girl)
- Chief Complaint: Annual check-up
- History
  - mother concerned about Lucy’s tanning behaviors
  - concerns about sunscreen safety (Vitamin D deficiency and safety of sunscreen ingredients)
- Physical Examination
  - blanchable mild erythema over nose, cheeks, foreheads, shoulders, and legs
  - no blisters and no tenderness upon palpation
- Questions
  - How are you going to discuss with the patient and her mother about sun safety?
  - Is tanning lamp safe?
  - Are the ingredients of sunscreen harmful for Lucy?



First, we’d like to present a case. It is your first day at an urban pediatric clinic as a third-year medical student. Your first patient (Lucy) is a 16-year-old girl who is in the clinic with her mother for annual check-up. Lucy is doing well medically. The mother expresses strong concern that her daughter has been tanning every day in her backyard without sunglasses and is even considering buying a tanning lamp online. She mentioned Lucy just had her “daily tanning routine” before coming to the clinic today. The mother never buys sunscreens because she heard wearing sunscreens can cause vitamin D deficiency and the ingredients are harmful.

The patient’s past medical history and family history are unremarkable. She denied any history of severe sunburn. She does not drink alcohol or use recreational drugs. Her allergies include peanuts and pollen. On examination, you noticed some blanchable mild erythema over her nose, cheeks, forehead, shoulders, and legs. There are no blisters and no tenderness upon palpation.

It is clear that Lucy has mild sunburn and how are you going to discuss with the patient and her mother about sun safety? Is tanning lamp safe? Are the ingredients of sunscreen harmful for Lucy?

## Introduction of UV Light

- Ultraviolet (UV) light is a form of electromagnetic radiation
  - UVA (wavelength of 315-400 nm )
    - photoaging
    - cancer formation
  - UVB (wavelength of 280-315 nm)
    - sunburns
    - increasing the risk of melanomas
- Many individuals receive 40-60% of their total lifetime UV exposure before 20
- Protection from the harms of UV light remains the most important modifiable risk factor for skin cancer

Before answering all those questions, we will start with some background information. Ultraviolet (UV) light is a form of electromagnetic radiation that is often classified into UVA (wavelength of 315-400 nm) and UVB light (wavelength of 280-315 nm). UVAs penetrate deeper into the skin and contribute to photoaging and cancer formation. UVBs affect the skin more superficially, causing sunburns and increasing the risk of melanomas. It is implicated in skin cancer formation. Protection from UV light is particularly important in childhood because currently, many individuals receive 40-60% of their total lifetime UV exposure before the age of 20. Protection from the harms of UV light remains the most important modifiable risk factor for skin cancer.

## Estimate the Risk

- Studies have shown that for adolescent patients, the deleterious effects of UV on appearance, including pigmentation and wrinkles, motivate them more effectively than fear of developing cancer.

UV Index	Exposure
0-2	Low
3-5	Moderate
6-7	High
8-10	Very high
11+	Extreme

The first step of sun safety is to understand the risk. It is important to tell caregivers to check the UV Index, which is a scale ranging from 0 to 11+ in Canada. The higher the UV Index, the more UV light will reach the ground from the sun and ultimately present a higher risk of sunburn. UV Index of 0-2 is low, 3-5 is moderate, 6-7 high, 8-10 is very high, and 11+ is extreme. It is important to educate patients and their caregivers about the risk and its implication. Studies have shown that for adolescent patients, the deleterious effects of UV on appearance, including pigmentation and wrinkles, motivate them more effectively than fear of developing cancer.

## Protective Methods

- Seek shade
- Wear clothes (tightly woven fabrics and dark colors)
- Wear a hat with a brim of 7.5 cm or 3 inches wide
- Other means
  - sunshades for strollers
  - special window glass with UVB and UVA protection



The first step to consider for sun protection is to seek shade. It is important to tell patients to minimize direct sun exposure from 11 am to 3 pm between April and September in Canada because the UV Index can be 3 or higher which means moderate risk of sunburn. A quick way is to tell patients and their caregivers to see if their shadow is shorter than they are. If so, it is particularly important to stay in the shade. Besides seeking shades, the simplest way is to wear clothes that cover as much of the body as possible. When picking the clothes, go with the ones made with tightly woven fabrics and dark colors but make sure they are loose and lightweight to avoid excessive heat. Sun-protective clothes with an UV Protection Factor (UPF) ranging from 15 to 50 are also available. UPF is an indicator of how much UV radiation a fabric allows to reach one's skin. For example, clothing with a UPF of 15 protects the skin from all but 1/15th of UV radiation. However, one study found that regular clothing may match or even exceed sun-protective clothing in blocking the transmittance of UV radiation. Therefore, the caregivers may not need to buy special sun-protective. Wearing a hat with a brim of 7.5 cm or 3 inches wide provides additional protection for the head and neck. For infants, sunshades are available for strollers. Common window glass provides a variable degree of UVC protection, but special window glass exists to provide both UVB and UVA protection. If the child spends a lot of time in the car, there are window films that can be applied to the side

windows of the car for further protection.

## Types of Sunscreen

- Organic vs inorganic
  - organic: avobenzone, oxybenzone, octocrylene, and ecamsule
  - inorganic: titanium dioxide and zinc oxide
- Formulation
  - creams, gels, and stick
  - spray: good for reapplication
- Tinted sunscreen better fits the complexion of dark-skinned people (UV + visible light)
- Some sunscreens come in fun colors that children enjoy

In terms of sunscreen classification, it is a common mistake for people to classify sunscreens into chemical (absorbs UV) vs physical (blocks UV) because they can absorb and block UV at the same time. It is more accurate to classify sunscreens into organic (avobenzone, oxybenzone, octocrylene, and ecamsule) vs inorganic (titanium dioxide and zinc oxide). In terms of formulation, creams are best for dry skin, gels good for hairy areas, and stick safe to use around the eyes. Spray formulas are popular among older children and teens, but it is challenging to know if a sufficient amount has been used to cover all sun-exposed areas. It can be a great option for reapplication and make sure to tell patients to spray an adequate amount and rub it in for even coverage. Never spray it around or near the face or mouth to avoid inhalation, and the spray may aggregate asthma. Tinted sunscreen is relatively newer to the market and it better fits the complexion of dark-skinned people while partially blocking visible light as well as UV. Some sunscreens come in fun colors that children enjoy.



## Sunscreen Selection

- Water-resistant broad-spectrum sunscreen with a SPF of at least 30
- Organic vs inorganic sunscreens
- Cautious about the labels of “sensitive skin” or “hypoallergenic”
- Sunscreens endorsed the Canadian Dermatology Association (CDA)



There are many sunscreens on the market now and it can be overwhelming to choose. It is important to educate patients and families about picking the right sunscreen. First, pick a water-resistant broad-spectrum (against both UVA and UVB) sunscreen with a SPF of at least 30. Some people may think the higher SPF is better. The truth is how much water resistance and how it is applied are more important to the level of protection obtained. We will talk about picking between organic vs inorganic sunscreens later. One of the drawbacks of inorganic sunscreen is that it can be more difficult to rub into the skin and patients would complain of white powdery residue on their skin, even with micronized formations. On the other hand, organic filters in the organic sunscreens can cause allergic or photoallergic reactions, but they are very uncommon with quoted prevalence of 0.8% from one Canadian study. The ingredients besides the sunscreen itself including the fragrance, preservatives, and formaldehyde releasers can also cause irritant or allergic contact dermatitis, so it is important to pick products with less of those ingredients to decrease the chance of irritant or allergic contact dermatitis. Interestingly, many sunscreens in the market that hold the labels “sensitive skin” or “hypoallergenic” actually contain allergenic and irritating UV filters, fragrances, preservatives, etc. This can be confusing for the patients and one simple way is to pick sunscreen that is endorsed the Canadian Dermatology Association (CDA). CDA expert advisory board recognized sunscreen

products that are broad-spectrum with a SPF 30 or higher, low potential for irritation, minimally perfumed or non-perfumed, and non-comedogenic. You can show the caregivers its logo so they can easily identify the products. At the end of the day, it is important to tell patients to use something they like the best themselves so that they will use them more routinely.

## Proper Application Sunscreen

- Check expiry dates
- Most sunscreens now work immediately when they are applied to the skin
- Reapply sunscreen after swimming or with heavy sweating
- Simplify the instruction so patients can be compliant with your recommendations
- Amount (teaspoon rule)
  - 1 teaspoon of sunscreen to the face and neck area
  - 1 teaspoon to each upper extremity
  - A total of 2 teaspoons to the front and back torso
  - 2 teaspoons to each lower extremity
- Lip balm with SPF of 30
- Children < 6 months: consider protective clothing or shade first



After picking a tolerable sunscreen with adequate protection, applying it properly is even more important. It is crucial to check expiry dates on sunscreen products before using them. The traditional recommendations for sunscreen application from doctors are to apply sunscreen 15-30 min before going outside. With the advancement in the technology of sunscreen production, most sunscreens now work immediately when they are applied to the skin. The current recommendation is to reapply every 2 hours. If sunscreen is applied sufficiently and correctly for the first time, there may be less of a need to reapply as frequently as we expect. However, one should be encouraged to reapply sunscreen after swimming or with heavy sweating. It's important to simplify the instruction so patients can actually remember and be compliant with your recommendations.

According to the Skin Cancer Foundation, most people use less than half of the recommended amount. For teenagers, you can educate about the teaspoon rule. It involves the application of 1 teaspoon of sunscreen to the face and neck area, 1 teaspoon to each upper extremity, a total of 2 teaspoons to the front and back torso, and 2 teaspoons to each lower extremity. Also, common areas to be missed include ears, neck, feet, hands, and even backs of the knees. Lastly, wearing lip balm with sunscreen SPF 30 is equally important. For children younger than 6 months old,

sunscreen is not usually recommended. However, the Canadian pediatric Society (CPS) does suggest an inorganic sunscreen SPF 30 to be used when protective clothing or shade is not accessible.

## Sunscreen Safety

- Bottom line: we cannot conclude that the sunscreen ingredients are dangerous
- “**G**enerally **R**ecognized **A**s **S**afe and **E**ffective” (**GRASE**) by FDA
  - Titanium dioxide
  - Zinc oxide
- Inorganic sunscreen may be a preferred option at this time if patients have strong concerns regarding sunscreen safety

Caregivers may bring up the concerns of systemic absorption of chemicals in the sunscreen and all the potential side effects. There is a recent study in 2019 which showed that many of the organic sunscreen ingredients are absorbed into the bloodstream when applied topically. The implication of this study is unclear. The bottom line is that we cannot conclude that the sunscreen ingredients are dangerous. In addition, the U.S. Food and Drug Administration's (FDA) updated regulatory requirements for sunscreen products and issued a proposed rule which asks manufacturers to provide more data about the safety of several sunscreen ingredients. Two ingredients, titanium dioxide and zinc oxide, were approved as “generally recognized as safe and effective” (GRASE) by FDA. Therefore, it seemed that inorganic sunscreen may be a preferred option at this time.

## Avoid Artificial UV Source

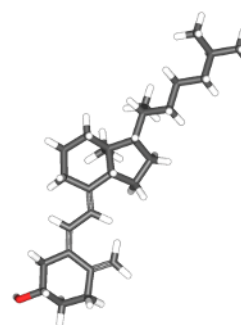


- Tanning lamps and beds can give off 2-5x more UVA radiation than natural sunlight
- CPS: people under the age of 18 years should be prohibited by law from using commercial indoor tanning facilities
- Education
  - A tan means the skin is sending out an SOS because they are being damaged by the UV light
- Harm reduction
  - Sunless tanning topical products containing dihydroxyacetone available

Tanning lamps and beds can give off 2-5 times more UVA radiation than natural sunlight, increasing the risk for malignant melanoma. CPS has consensus that people under the age of 18 years should be prohibited by law from using commercial indoor tanning facilities. It is important to tell the adolescents that a tan means the skin is sending out an SOS because they are being damaged by the UV light. For teenagers who still believe tanned skin are perceived as more attractive and favorable, there are sunless tanning topical products containing dihydroxyacetone available, which is essential a harm reduction strategy.

## Vitamin D Absorption

- For children one year of age or younger, 400 IU of vitamin D (or 200 IU/kg/day for premature infants) is recommended by CPS
- Children younger than 2 years of age living above a northern latitude of 55 degrees (approximate latitude of Edmonton), those with dark skin, and those avoiding sunlight should be supplemented with 800 IU in the winter months (October to April)
- For children older than one year of age through adolescence, Health Canada recommends 400 IU of vitamin D daily



Sunscreen decreases the synthesis of vitamin D in the skin, but oral vitamin D supplement is a much safer, inexpensive, and well-tolerated way to achieve sufficient vitamin D without UV damage from the sun. For children one year of age or younger, 400 IU of vitamin D (or 200 IU/kg/day for premature infants) is recommended by the Canadian Paediatric Society (CPS). Children younger than two years of age living above a northern latitude of 55 degrees (approximate latitude of Edmonton), those with dark skin, and those avoiding sunlight should be supplemented with 800 IU in the winter months from October to April. For children older than one year of age through adolescence, Health Canada recommends 400 IU of vitamin D daily.

## Common Pitfalls

- 80% of the UV rays can go through the clouds and one can get sunburn on even cloudy days
- Be aware of the surroundings as snow, water, concrete, and sand can reflect and increase the effect of UV radiation
- Apply sufficient sunscreen about 20 min before insect repellent
- Avoid products with a combination of repellent and sunscreen



It is crucial to communicate with the caregivers that up to 80% of the UV rays can go through the clouds and one can get sunburn on even cloudy days. Be aware of the surroundings as snow, water, concrete, and sand can reflect and increase the effect of UV radiation. Children may also use other topic products besides sunscreen. Many insect repellents, have as their active chemical ingredient, N,N-diethyl-meta-toluamide (DEET), which can make sunscreen less effective, it is important to apply sufficient sunscreen about 20 min before insect repellent. Avoid products with a combination of repellent and sunscreen because sunscreen may need to be reapplied more often than repellent.



## How to Deal with Sunburn

- Signs of sunburn: erythema, edema, burning sensation or even blisters
- Seek medical attention if sunburn happens in a baby less than 1 year old
- Older patients: blisters with the risk of infection, significant pain, or fever
- Basic strategies:
  - for rehydration, give child water
  - avoid further sun exposure
  - use cool water compression or a cool bath to help skin feel better
  - acetaminophen or ibuprofen for pain management

The signs of sunburn, including erythema, edema, burning sensation or even blisters, usually appear 6-12 hours after sun exposure and the patients can be more symptomatic by then, and the full effect may take 24 hours to appear. Ask the caregivers to seek medical attention if sunburn happens in a baby less than 1 year old. Blisters with the risk of infection, significant pain, or fever are the reasons for medical attention for older patients. Some basic strategies you can recommend to the caregivers for milder sunburn:

- For rehydration, give child water
- Avoid further sun exposure
- Use cool water compression or a cool bath to help skin feel better
- Acetaminophen or ibuprofen for pain management

## Sun Protection for the Eyes

- UV radiation can damage multiple parts of the eye
- Conditions linked to ultraviolet radiation exposure
  - Acute: e.g., photokeratoconjunctivitis (PKC)
  - Chronic: e.g., cataracts, eye cancers, pterygiums, and macular degeneration

Protection for the eyes is as important as that for the skin but it is often neglected in pediatric populations. In fact, UV radiation can damage multiple parts of the eye, so it's important to choose sunglasses that help prevent the associated diseases. It's challenging to quantify sun exposure and the risk it contributes to each of these diseases. Nevertheless, these conditions often develop in adulthood, so early investment in sun protection is important for adult health.

A number of conditions have been linked to ultraviolet radiation exposure, whether it is acute such as in photokeratoconjunctivitis, or long-term consequences, such as cataracts, eye cancers, pterygiums, and macular degeneration.

## How to Deal with Sunburn

- **Sunglasses with broad-spectrum protection against both UVA and UVB rays**
  - Cosmetic sunglasses block up to 60% of visible light and UVA, and 87.5-95% of UVB rays
  - General purpose sunglasses block 60-92% of visible light and UVA, and 95-99% of UVB rays
  - Special purpose sunglasses block 97% of visible light and 98.5% of UVA, and 99% of UVB
- **A balance between protection and visibility must be made**
- **Factors determine the effective of sunglasses**
  - Size
  - Closeness to the face
  - Orientation of the sun
  - Cloud and any reflections from other surfaces
  - Face-forward position



Sunglasses should provide broad-spectrum protection against both UVA and UVB rays. Cosmetic sunglasses block up to 60% of visible light and UVA, and 87.5-95% of UVB rays. General purpose sunglasses block 60-92% of visible light and UVA, and 95-99% of UVB rays. Special purpose sunglasses block 97% of visible light and 98.5% of UVA, and 99% of UVB. While these are all suitable options, increasing ability to filter UV is often accompanied by increased ability to filter visible light, so a balance between protection and visibility must be made. A number of factors determine the effective of sunglasses, from the size, the closeness to the face, the orientation of the sun, the cloud and any reflections from other surfaces. The face-forward position is a particularly vulnerable position as the UV enters at the space between the sunglasses and the face.

## Sun Protection for the Eyes

- Sunscreen should be applied to the skin around the eyes
- As children sweat, the sunscreen may run into the eyes, causing stinging and irritation (eyes should be flushed thoroughly with water)
- In general, inorganic sunscreens cause less eye irritation

Sunscreen should be applied to the skin around the eyes as mentioned before. As children sweat, the sunscreen may run into the eyes, causing stinging and irritation. This is not damaging to the eyes, but if it happens, the eyes should be flushed thoroughly with water. Different formulations such as those for sports, may be less runny, but this will vary from person to person. In general, inorganic sunscreens cause less eye irritation.

## Case – Treatment Plan

- Sunburn: cool water and managing the burning pain with ibuprofen if needed
- Patient education
  - emphasize the risk of melanoma and photoaging with any artificial UV source
  - sunless tanning topical products (a harm reduction strategy)
  - non-sunscreen and sunscreen methods for sun protection
  - discuss specific strategies that would work for Lucy
- 400 IU of vitamin D daily as per Health Canada recommendation
- Future check-up
  - incorporate the discussion of sun safety
  - ensure if Lucy is compliant with your recommendations

Let's go back to the case of our patient, Lucy. To recap, she is a healthy 16-year-old female with a recent history of sun tanning who presents with diffuse, mild erythema over multiple body areas. For Lucy's mild sunburn, you should counsel Lucy and her mother on treating it with cool water and managing the burning pain with ibuprofen if needed. In terms of sun protection, you should emphasize the risk of melanoma and photoaging with any artificial UV source. For patients insistent on having a tanned appearance, sunless tanning topical products can provide that look without UV damage and would constitute a harm reduction strategy. Compliance with your recommendations is very important in teenage population. Afterwards, you want to review both non-sunscreen and sunscreen methods for sun protection and discuss specific strategies that would work for Lucy. Lastly, Lucy should also take 400 IU of vitamin D daily as per Health Canada recommendation. It is also important to incorporate the discussion of sun safety as part of the regular check-up and ensure if Lucy is compliant with your recommendations.

## Take Home Points

1. There are many other methods besides for sun protection besides sunscreen, including seeking shades, wearing protective clothes, and picking window glass with UV protection. Those should be recommended first to patients and their caregivers as a first-line approach to be supplemented with sunscreen to any remaining exposed skin.
2. Sunscreens generally have a good safety profile. Inorganic sunscreen like zinc oxide and titanium dioxide can be recommended to parents with concerns related to systemic absorption.
3. It is crucial to educate adolescent patients to avoid tanning beds and lamps since they significantly increase the risk of developing melanoma.



We hope you found our podcast helpful and learned something new. Here are some quick take home messages for you:

There are many other methods besides for sun protection besides sunscreen, including seeking shades, wearing protective clothes, and picking window glass with UV protection. Those should be recommended first to patients and their caregivers as a first-line approach to be supplemented with sunscreen to any remaining exposed skin.

Sunscreens generally have a good safety profile. Inorganic sunscreen like zinc oxide and titanium dioxide can be recommended to parents with concerns related to systemic absorption.

It is crucial to educate adolescent patients to avoid tanning beds and lamps since they significantly increase the risk of developing melanoma.

This concludes our discussion for sun protection. We hope to discuss about pediatric pigmented skin and eye lesions as well as cutaneous and ocular melanoma in our next podcast. Thank you for listening to PedsCases Podcasts!

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