L'ORÉAL
Dermatological Beauty

UV RADIATION AND PHOTOPROTECTION

ULTRAVIOLET (UV) RADIATION AND ITS IMPACT ON SKIN

Ultraviolet (UV) radiation is a form of **electromagnetic radiation emitted by the sun** that can have profound effects on human skin . Understanding the different types of UV radiation and their specific dermatologic impacts is crucial for effective photoprotection.

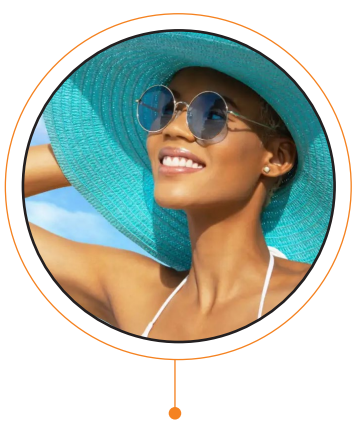
	UVA	UVB	UVC
Wavelength	**315-400nm**	**280-315nm**	**100-280nm**
Impact	Longer wavelength allows for this type of radiation to penetrate the skin's dermis.	Most UVB is filtered by the ozone layer, but the remaining can penetrate the epidermis of the skin.	Least harmful UV radiation, almost all UVC is absorbed by the earth's ozone.
Effects on Skin	This far-reaching UV radiation can contribute to skin tanning, aging and wrinkling.	UVB radiation can cause delayed tanning and burning.	Since most UVC is absorbed by the ozone layer, there is very little impact on skin[1].

PROTECTION AGAINST HARMFUL UV RADIATION

Comprehensive UV radiation protection is crucial. Key recommendations to reduce the harmful effects of UV radiation include:

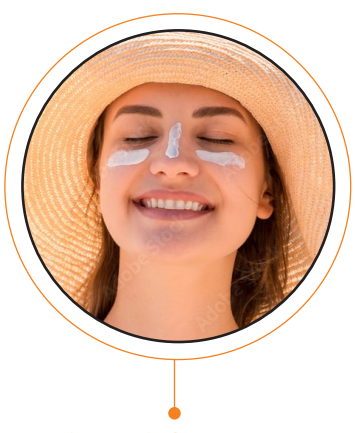
STRATEGIC SUN AVOIDANCE

Limit direct sun exposure, particularly during peak UV index hours, typically between 10 a.m. and 2 p.m., when solar radiation is most intense.



PROTECTIVE ATTIRE

Consistent use of physical barriers such as long-sleeved shirts, trousers, broad-brimmed hats, and UV-filtering sunglasses to shield exposed skin and eyes.



SUNSCREEN APPLICATION

Regular application of broad-spectrum sunscreens with a Sun Protection Factor (SPF) of 30 or higher.

FREQUENT REAPPLICATION

Emphasize the importance of reapplying sunscreen at least every two hours, and more frequently following activities that may diminish its efficacy, such as sweating or swimming[2].

UNDERSTANDING SUNSCREENS

Sunscreen can help protect against the harmful effects of UVA and UVB radiation by absorbing or reflecting the harmful rays.

Sun protection factor (SPF) measures how much UV radiation is required to sunburn skin protected with sunscreen compared to unprotected skin. For example, skin protected with SPF 30 would take 30 times longer to burn than skin without any protection. Additionally, higher SPF ratings generally offer more protection against UVB than lower SPF ratings.

SPF VALUE AND PROTECTION AGAINST UVB RADIATION

97%
OF UVB BLOCKED OR ABSORBED

98%
OF UVB BLOCKED OR ABSORBED

CHEMICAL VS MINERAL SUNSCREEN

CHEMICAL

KEY COMMON ACTIVE INGREDIENTS:
Avobenzone, Homosalate, Octisalate, Octocrylene

MECHANISM OF ACTION:
Absorb UV rays upon contact with the skin, which is then converted into heat and released from the skin

BEST FOR:
Darker skin tones

MINERAL

KEY COMMON ACTIVE INGREDIENTS:
Titanium Dioxide, Zinc Oxide

MECHANISM OF ACTION:
Reflect and scatter UV rays away from the skin

BEST FOR:
Sensitive and acne-prone skin

UV COVERAGE OF COMMON FILTERS

	UVB 290-320nm	UVA 1 340-400nm	UVA II 320-340nm
Avobenzone		✓	✓
Homosalate	✓		
Octisalate	✓		
Octocrylene	✓		✓
Titanium dioxide	✓		✓
Zinc oxide		✓	✓

Sunscreen with chemical ingredients consist of an aromatic compound conjugated with a carbonyl group that allows high energy UV rays to be absorbed. The energy is then released as heat. Chemical sunscreens contain UVB blockers that absorb all UVB radiation from 290 to 320nm wavelength. Some chemical sunscreens also contain UVA filters; however, this varies from ingredient to ingredient.

Mineral sunscreens work like a physical barrier to reflect and scatter UV rays away from penetrating the skin. Titanium dioxide and zinc oxide are the two most commonly used mineral ingredients. Titanium dioxide provides effective filtration of UVB and a portion of UVA radiation. In contrast, zinc oxide offers strong protection primarily against UVA rays, with less efficacy against UVB[3].

OTHER COMPONENTS IN SUNSCREEN FORMULAS

Many other ingredients are combined with active sunscreen ingredients to improve stability, boost performance, and improve the feel and texture of the product. Below are some of the components that may be found in sunscreen[4].

EMULSIFIERS

Stabilize mixtures of water and oil-based ingredients

EMOLLIENTS

Dissolve and solubilize UV filters for better distribution on the skin

FILLERS

Adjust the consistency and volume of the product

PRESERVATIVES

Extend product shelf life by preventing bacteria and mold growth

SENSORY ENHANCERS

Improve the touch and feel of the product

THICKENERS

Increase viscosity and improve texture, stability, and spreadability

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2. U.S. Food and Drug Administration. (n.d.). Sunscreen: How to Help Protect Your Skin from the Sun. Retrieved from https://www.fda.gov/drugs/understanding-over-counter-medicines/sunscreen-how-help-protect-your-skin-sun
3. Gabros S, Patel P, Zito PM. Sunscreens and Photoprotection. [Updated 2025 Mar 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK537164/
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