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## Place of sun protection products in the photoprotection strategy

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### Abstract

The effects of solar radiation are not always beneficial. As one of the risk factors for the occurrence of melanomas, unnecessary exposure to UV rays must be the subject of public awareness. In this paper, the sun protection product will be described widely to understand their place in photoprotection strategy.

**Keywords:** UV radiation; Sun protection product; Photoprotection; Melanoma

### 1. Introduction

Overexposure to solar radiation is certainly one of the major risk factors for the occurrence of skin cancer. In 2020, the WHO recorded more than 1.5 million cases of skin cancer, including more than 120,000 associated deaths [1]. In this worrying situation, the idea that exposing the body to the sun could be harmful to health is becoming more and more widespread.

Photoprotection is the most effective way to prevent the immediate or delayed harmful effects of the sun. The use of sun protection products SPP is essential in the photoprotection strategy. To do this, SPP must be easy to use, pleasant to apply and should not represent a risk for the consumer. More than for any other cosmetic product, the formulation of SPP touches on various areas, both regulatory, chemical, physical and biological.

Solar radiation consists of electromagnetic waves, 51% of which are in the infrared, 48% in the visible, 01% in the ultraviolet, mainly UVB (290 to 320 nm) and secondarily UVA (320 to 400 nm) [2].

In the skin, UVB allows the formation of vitamin D, an essential element for the optimal absorption and fixation of Calcium by the bones. Thus, it is recommended to expose ourselves moderately while protecting our skin to ensure adequate supply vitamin D. However, UVB directly absorbed by the pyrimidine bases of the DNA of keratinocytes, generates alterations within of their chemical structure which could be the cause of the appearance of cellular mutations, which would lead to the development of melanomas [1].

Furthermore, UVA generates free radicals capable of damaging cellular structures including DNA, proteins, and lipids. Thus, UVA degrades collagen and causes premature skin aging which results in the appearance of spots and skin thinning [1].

Actinic erythema is the most obvious acute phenomenon of photo-induced effects. It manifests skin redness, whose intensity depends on the dose received and can lead to the appearance of apoptotic cells, with edema and painful sensation. UVB is approximately 1,000 times more effective than UVA in inducing this effect. However, given the low

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representation of UVB in the solar spectrum, the weight of UVA in the erythematous response, although low, is still not negligible: around 15% [3].

The photoprotection strategy includes various internal or external means capable of opposing skin damage induced by solar radiation. SPP can only be used in addition to other methods of physical protection (shade seeking, covering clothing, wide-brimmed hat, and sunglasses). However, they should not be used to increase exposure time [4].

SPP is any preparation (cream, oil, gel, aerosol) intended to be placed in contact with human skin for the exclusive or main purpose of protecting it from UV radiation by absorbing, dispersing, or reflecting this radiation [5]. For this, the SPP must:

- Provide UVB protection with a sun protection factor of 6 (SPF=6).
- Provide UVA protection with a protection factor equivalent to 1/3 of the SPF.
- Cover the longest UVA, which corresponds to a minimum critical wavelength of 370 nm [6].

The SPP is composed of chemical filters acting as chromophores by absorbing light energy according to their absorption spectrum, inert mineral screens reflecting and/or diffusing radiations. It also contains preservatives, colorings and fragrances agents as excipients [4].

Given the specificity of their absorption spectra, UVB, UVA or both, the filters are often associated with each other in order to optimize the quality of the resulting absorption spectrum. Thus, they must be effective at low concentrations; photo-stable; non-toxic and non-allergenic; compatible with excipients; low cost and broad UVB/UVA spectrum [2].




The protective power against UVB is indicated by their SPF. There are eight levels of protection (6, 10, 15, 20, 25, 30, 50 and 50+). A skin on to which a SPP of SPF 20 has been applied, will therefore theoretically take twenty times longer to develop a sunburn than skin without protection.

The stability of SPP as well as the specific safety tests of solar products are the subject of various recommendations. The latter aim to evaluate the Stability under accelerated aging conditions, in extreme conditions (hot/cold cycles) and under light (photo-stability) [5].

To choose the right SPP, we must take into consideration the category of sun protection which should be indicated on the labelling, the exposure conditions and the phototype of the subject (See tables). The choice of the galenic form (cream, spray, lotion, etc.) is done according to the surface to be protected and the comfort of application.

The proper use of SPP is a determining factor in the effectiveness of photo-protection. The quantity applied must be close to 2 mg/cm<sup>2</sup>, the quantity which is used to define the labelled SPF. The quantity and frequency of application of the SPP should not be reduced on the pretext of having used a very high SPF [7]. Thus, in case of allergic or photo-allergic history, it is necessary to read the qualitative composition of the product.

**Table 1** Important factors to consider when choosing the right SPP

	Moderate exposure 	Important exposure 	Extreme exposure 
Subject extremely sensitive to the sun	High protection (SPF 30 – 50)	Very high protection (SPF 50+)	Very high protection (SPF 50+)
Subject sensitive to the sun	Medium Protection (SPF 15-20-25)	High protection (SPF 30 – 50)	Very high protection (SPF 50+)
Subject to intermediate skin	Low Protection (SPF 6 – 10)	Medium Protection (SPF 15-20-25)	High protection (SPF 30 – 50)
Subject with resistant skin	Low Protection (SPF 6 – 10)	Low Protection (SPF 6 – 10)	Medium Protection (SPF 15-20-25)

## 2. Conclusion

In conclusion, it is essential that this type of product be subject of community provisions in order to offer a clear message to the population concerning protection against the deleterious effects of solar radiation.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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