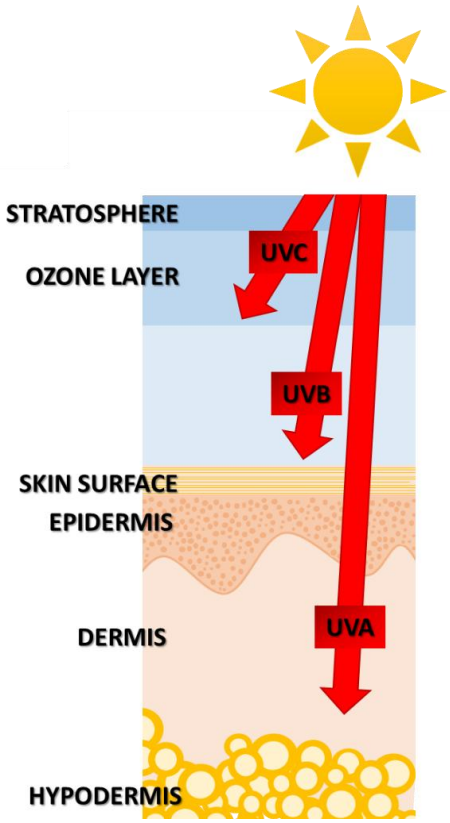
The Skin and Sun Protection

We all like the sun. A warm feeling on our skin causes the release of endorphins, our mood is better, and our energy levels increase. Sun exposure supports the synthesis of vitamin D, which is involved in calcium-phosphate metabolism and supports the maintenance of the structure and function of the skeleton. The sun also stimulates the secretion of melatonin, the sleep hormone, a powerful antioxidant, anti-ageing agent, immunoregulator and anti-depressant. All these positive aspects of the sun provide benefits to our body, however, they are only one side of the coin. The sun is a source of ultraviolet radiation and at excessive levels can adversely affect our health.

Solar radiation that reaches the Earth is made up of visible light (50%), infrared light (40%) and ultraviolet light (10%). The types of UV radiation are characterized by a specific electromagnetic wavelength - the shorter the wavelength, the greater the radiation energy, also expressed by its intensity.

- UVC rays (100-280 nm) - do not reach the Earth's surface because they are absorbed by the Earth's atmosphere; However, as the ozone layer gets thinner, the protective filter activity of the atmosphere is progressively reduced, and people are exposed to higher levels of UV radiation
- UVB rays (280-320 nm) - represent around 5% of solar radiation, they cause erythema on the skin during sunbathing; play the greatest role in causing skin cancers
- UVA rays (320-400 nm) - represent about 95% of solar radiation, reach the deeper skin layer - dermis, the effects of UVA radiation are not visible immediately, but it is responsible for accelerated ageing - damages collagen and elastin fibres, causes discolouration and photoallergy

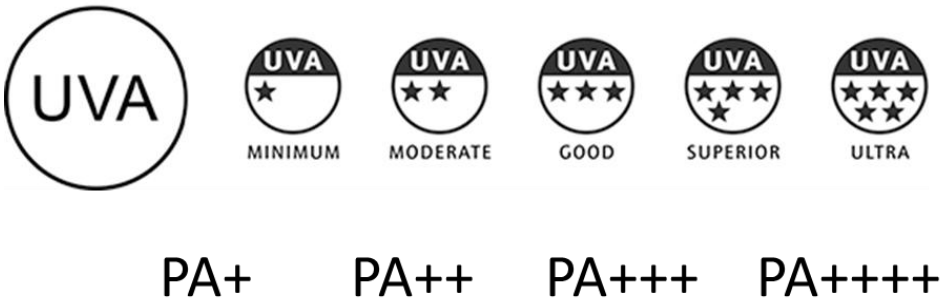


Many factors affect the intensity of ultraviolet radiation and the ratio of UVA to UVB: latitude, season, sun altitude, meteorological conditions, terrain, ozone layer thickness. Solar radiation is transmitted and reflected by water, snow, and sand. Our everyday clothes, windows in our houses and cars (except the windshield) also do not provide protection against ultraviolet radiation, it is estimated that 50% of UVA exposure occurs in the shade.

Does this mean that in order to take care of our health, we must always avoid exposure to the sun longer than the recommended 15 minutes a day, necessary to initiate the synthesis of vitamin D? Fortunately, in this case, as in many others, science comes to our aid. Sunglasses with UV protection, special clothing with sun filters (marked as UPF) or cosmetic products rich in sun filters provide us with effective protection and allow us to enjoy the sun without negative consequences.

Now let's focus on protecting our skin. Products that provide us with protection against the harmful effects of ultraviolet radiation are marked with the SPF abbreviation on the packaging - **s**un **p**rotection **f**actor. We may see the indication SPF6, 15, 30, 50 or 50+, but what does it really mean? SPF is a measure of how much solar energy (UV radiation) is required to produce sunburn on protected skin (i.e., in the presence of sunscreen) relative to the amount of solar energy required to produce sunburn on unprotected skin.

As the SPF value increases, sunburn protection increases. SPF is not directly related to time of solar exposure but to amount of it – application of SPF30 does not allow us to safely stay in the sun 30 hours or 30 minutes, it refers to the quantity of solar radiation that can be protected against compared to unprotected skin. Another aspect for us all to remember is the fact that SPF only means protection against UVB radiation. If we want our cosmetic to protect us from the long-term effects of sunlight, it is important to look for information on protection against UVA radiation on the packaging. It can be labeled as a PA+ rating (**P**rotection Grade of UV**A** rays; PA +, PA ++; PA +++; PA ++++) or as a UVA in a circle. The first system was developed in Japan to represent how much UVA protection is offered by the product. The second system was established by European Union and the presence of UVA in circle means that the UVA protection is a minimum of 1/3 of the UVB one – for SPF50 UVA protection is around 16.



The compounds used in the production of cosmetics and responsible for sun protection can be divided into two groups, mineral and chemical filters:

Mineral (physical) filters:

- inorganic compounds
- work in the same way as chemical filters, absorb 95% of UV radiation, and reflect only 5% (the assumption that they act as a protective shield reflecting UV radiation from the skin surface is incorrect and has been refuted by scientific research)
- titanium dioxide; zinc oxide

Chemical filters:

- organic compounds
- mimic the effects of melanin, the natural pigment found in the skin. They penetrate deep into the epidermis and there they absorb the energy carried by solar radiation, turning it into heat
- Tinosorb S, Tinosorb M, Uvinul A Plus, Ethylhexyl Salicylate, Uvasorb HEB, Mexoryl SX, Neo Heliopan AP, Octocrylene, Benzophenone-3, Benzophenone-4, Homosalate

Regardless of what type of UV filter we decide to use, the key issue is the amount we apply to the skin. It has been estimated that the average amount of sunscreen that we put on the face is 2.5 times smaller than that guaranteed the protection stated on the package.

Both mineral and chemical filters must be applied to the skin at a rate of 2 mg/cm^2 to ensure the protection stated by the manufacturer.

This is due to the fact that this amount of product is always used for laboratory testing. To simplify, we can assume that we should apply 1.25 ml of the sunscreen on the face. We can use a measuring spoon each time to check the right amount of product, but the easier way seems to be the two fingers rule - just cover the full length of your first two fingers with sunscreen and apply. A study published in March this year revealed that applying half the recommended dose of SPF50+ did not guarantee protection even at level of SPF25, the average for the study participants was SPF19.

Research on new chemical compounds as well as finished cosmetic products in terms of their protective effect on the skin is carried out in laboratories both *in vivo* and *in vitro*. In Shannon ABC laboratories, thanks to the use of cell cultures derived from human skin cells (keratinocytes and fibroblasts), we are able to assess the impact of various compounds on parameters related to skin exposure to UV: cell proliferation, ability to produce collagen and elastin, the level of oxidative stress or DNA damage. Please see www.shannonabc.ie for more information.