# به نام خدا

## فرآورده های ضد آفتاب

## *Sunscreens*

# Sun light

Sun Moderate exposure has beneficial effects on human health:

It gives light, warmth, and energy, Antimicrobial, Antidepressant, peace of mind and general well-being. It also stimulates blood circulation, increases the formation of hemoglobin, and may also promote a reduction in blood pressure.

It plays a critical role in producing vitamin $D_3$ which enhances the absorption of calcium.

Finally by producing melanin and causing thickening of the horny layer of the skin, it plays an essential role in the formation of the body’s natural protective against sunburn.

# Adverse reactions to the sun UV rays

- Short-term inflammatory responses:

1. dehydration
2. Erythema
3. Edema
4. sunburn.

- Long-term effects:

1. suppression of the immunological system
2. photosensitivity
3. skin cancers
4. thickening of the skin
5. loss of natural elasticity, laxity, roughness, dryness
6. irregular hyperpigmentation
7. cutaneous photoageing
8. deep wrinkles.

# Ultraviolet radiation (UVR)

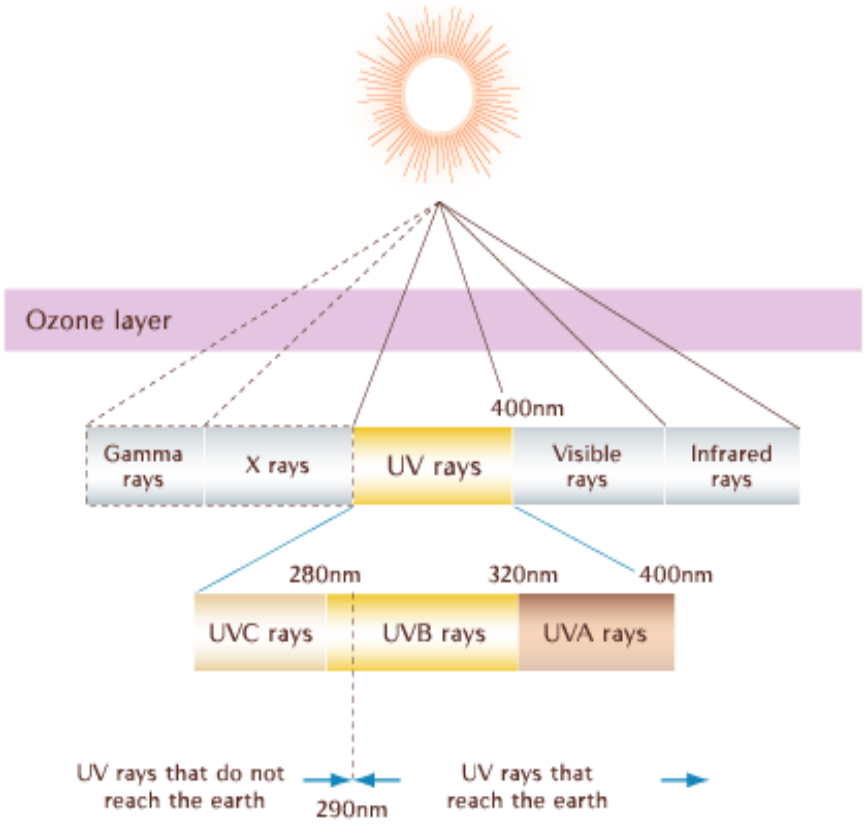
UVC (200-290 nm)

UVB (290-320 nm)

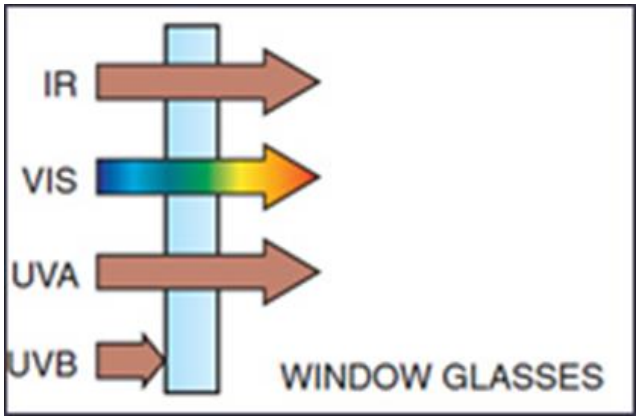
UVA (320-400 nm)

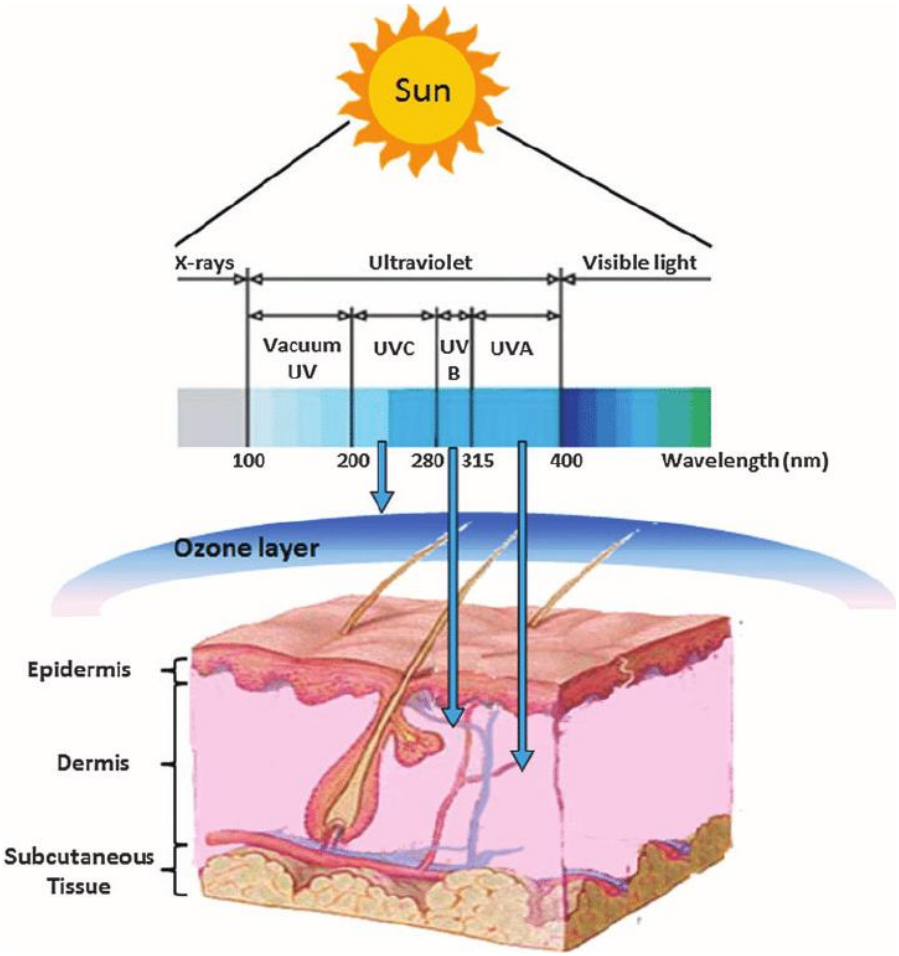
UVA II, 320 – 340nm

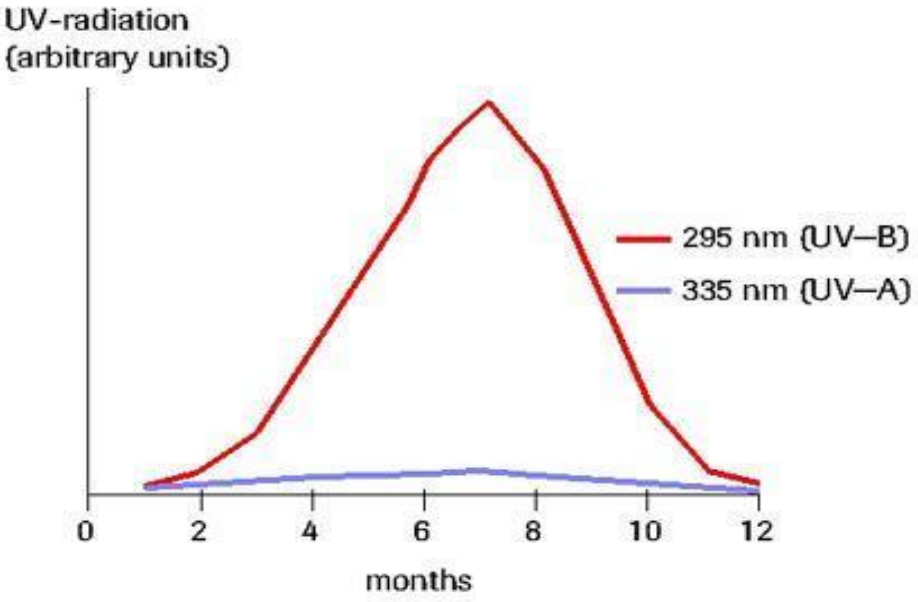
UVA I, 340 – 400nm

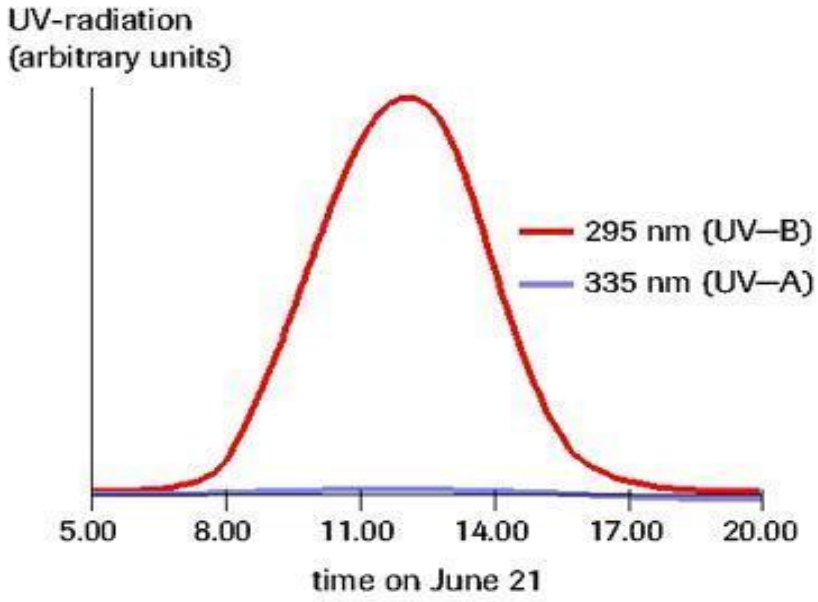


# Solar spectrum wavelength and their penetration to the skin in different layers of the skin

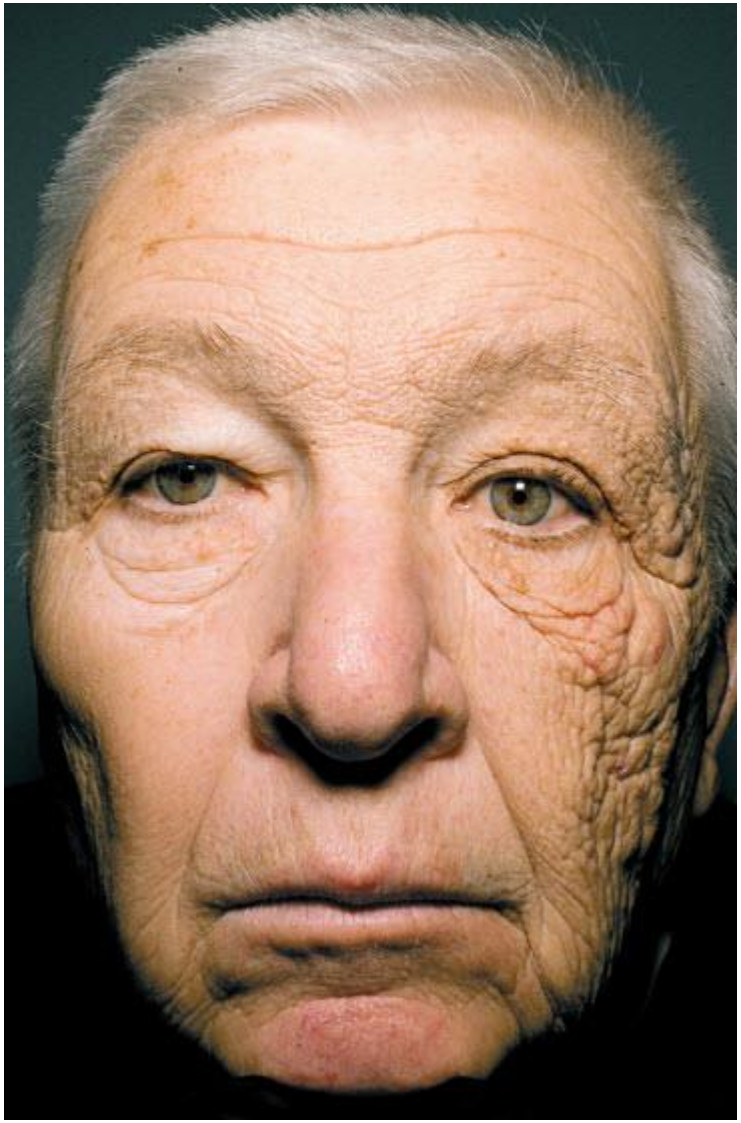





**Hourly and monthly variation in amount of UVA and UVB radiations during a day and a year**



# UV Reflection from different surfaces

UV radiation can be reflected from snow (80% to 90%), water (up to 30%), grass (2.5% to 3%) and sand (20% to 30%).

Pollutants, clouds, and fog can decrease the UVR reaching the earth’s surface by scattering the radiation.

# For Sun Protection

Limit Time in the Midday Sun (between 10 am and 4 pm).

Seek Shade .Staying under cover.

Use Sunscreen .A broad spectrum sunscreen with a SPF of at least 15.

Wear a Hat . Hat is good sun protection for your eyes, ears, face and the back of your neck.

Wear Sunglasses. That Block 99 to 100 Percent of UVR.

Watch for the UV Index (0-15). The UV index is an international standard measurement of how strong the UVR from the sun is at a particular place and day.

Wear long sleeves and pants when playing or working outdoors. Darker colors and fabric with a tight weave provide the most protection.

**Table 2 History of Photoprotection**

| Year | Advances |
|---|---|
| 1887 | Veiel started using tannin as photoprotector |
| 1891 | Hammer studied various topical photoprotective agents |
| Early 1900s | Zinc oxide, magnesium salts, bismuth were used as photoprotective agents |
| 1928 | First commercial sunscreen with benzyl salicylate and benzyl cinnamate became available (United States) |
| 1943 | PABA patented |
| 1944 | Green developed red veterinary petrolatum, used by soldiers during World War II as sunscreen |
| 1948 | PABA esters became available |
| 1962 | First UVA filter, a benzophenone, was introduced |
| 1974 | Greiter popularized "SPF," which was first proposed by Schulze in 1956 |
| 1977 | First waterproof sunscreen became available |
| 1978 | FDA published guidelines on sunscreens, and adapted SPF method to assess sunscreens |
| 1979 | Long UVA filter, dibenzoylmethane derivatives, became available |
| 1989–1992 | Micronized inorganic filters became available (titanium dioxide in 1989, zinc oxide in 1992) |

*Abbreviations*: PABA, para-aminobenzoic acid; SPF, sun protection factor; FDA, Food and Drug Administration.

# Sunscreen products

Sunscreen products in the United States and Australia are regulated by the FDA as over-the-counter (OTC) drugs.

In Europe, sunscreen products are considered to be cosmetics, their function being to protect the skin from sunburn.

In Japan, sunscreens are classified as cosmetics.

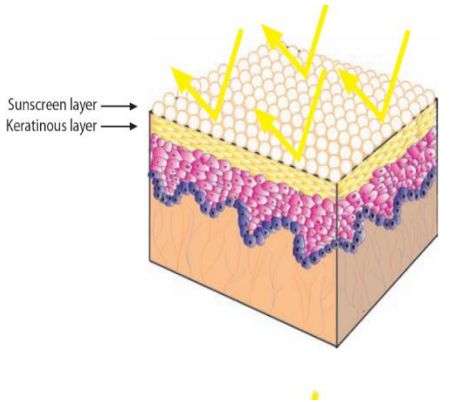
# Sunscreens

Physical sunscreens

Scatter UV: include titanium dioxide, zinc oxide, talc, kaolin, calamine barium sulfate, magnesium oxide, iron oxide and red petrolatum jelly.

microfine and nano sized zinc oxide and titanium dioxide (TiO2)

Microfine and coated Tio2 is better




Mode of action of a physical sunscreen that reflects radiati

# Physical sunscreens

Physical blockers have the advantage of lowered skin irritancy and penetrating and photostability. IR, UVR

Titanium Dioxide (TiO2): UVA and UVB

TiO2 was the first micropigment extensively used. Advantages include a broad spectrum of protection and inability to cause contact dermatitis.

Microfine TiO2 at an equal concentration offers somewhat more protection in the UVB range.

# Physical sunscreens

Particle size needs to be less than 200 nm to achieve transparency.

Zinc Oxide (UVA and UVB)

ZnO has a refractive index of 1.9 as opposed to 2.6 for TiO2, and therefore causes less whitening than TiO2.

ZnO attenuates UVR more effectively in the UVA I range.

# Chemical sunscreens

Absorb UV benzophenone derivatives, salicylic acid derivatives, cinnamates, para-amino benzoic acid derivatives, anthranilates, dibenzoylmethanes some camphor, Sulfonic Acid and Triazone derivatives, and a few miscellaneous chemicals.

There are some oils which can absorb UVR. Olive oil, avocado oil, coconut oil, cotton oil, almond oil and sesame oil.

The degree of absorption depends on the substance and its concentration.

# Chemical sunscreens

PABA derivatives: UVB absorber, high penetration, color, water soluble compound paba (padimate O)

Cinnamates; Potent UVB absorbers, replaced PABA derivatives, less water resistant. Octinoxate (octyl methoxycinnamate) is most frequently used.

Cinoxate (ethoxy-ethyl-p-methoxycinnamate), Isoamyl p-methoxycinnamate

Octocrylene: is cinnamates. It can be used to boost SPF and improve water resistance in a given formulation. Octocrylene is photostabile and can improve the photostability of other sunscreens. It is expensive and can present difficulties in formulation.

# Chemical sunscreens

Camphor Derivatives

UVB absorber, Except Tetraphtalydine dicamphor sulfonic acid (Mexoryl SX)

(UVA absorber) .Not approved by the FDA in the US but not in Europe.

Phenylbenzimadazole Sulfonic Acid (Ensulizole)  (PSA)

It is a water-soluble UVB absorber, allowing for a less-greasy more aesthetically pleasing formulation such as a daily use moisturizer containing sunscreen. Ensulizole boosts the SPF of organic and inorganic sunscreens. It can also be used in clear gels owing to its water solubility.

# Chemical sunscreens

**Salicylates**

Salicylates are weaker UVB absorbers.

Octyl salicylate, homosalate (homomenthyl salicylate).

Trolamine (triethanolamine salicylate) has good water solubility.

# Chemical sunscreens

Menthyl Anthranilate

Meradimate (menthyl anthranilate) is a weak UVB filter, UVA II.

It is less less widely used.

# Chemical sunscreens

Triazones  No irritation

Tinosorb M (Bisoctrizol): UVA , UVB.

Tinosorb S (Bemotrizinol): UVA , UVB.

# Chemical sunscreens

Benzophenones

Oxybenzone (benzophenone-3); UVB, UVA II. It boosts SPF values in combination with other UVB absorbers. Has poor solubility in water.

Sulisobenzone (benzophenone-4) UVB, UVA II. is water soluble, somewhat unstable, and used with less frequency.

Irritation

Penetration

No permitted in children

# Chemical sunscreens

Avobenzone

Avobenzone (Butyl methoxydibenzoylmethane, Parsol 1789 ) UVAI UVB. Better than benzophenone.

EU no. …Parsol 1789, Eusolex

Irritation

**List of US Food and Drug Administration-approved ultraviolet (UV) filters, their maximum allowable concentration, and UV absorbance**

| Drug Name (Active ingredient) | Concentration (%) | Absorbance |
|---|---|---|
| Para Aminobenzoic acid | Up to 15 | UV-B |
| Padimate O (Octyl dimethyl PABA) | Up to 8 | UV-B |
| Octinoxate (Octyl methoxycinnamate, Parsol MCX) | Up to 7.5 | UV-B |
| Cinoxate | Up to 3 | UV-B |
| Octysalate (Octyl salicylate) | Up to 5 | UV-B |
| Homosalate (Homomenthyl salicylate) | Up to 15 | UV-B |
| Trolamine salicylate | Up to 12 | UV-B |
| Octocrylene | Up to 10 | UV-B |
| Ensulizole(Phenylbenzimidazole sulfonic acid) | Up to 4 | UV-B |
| Oxybenzone (Benzophenone-3) | Up to 6 | UV-B, UV-A II |
| Sulisobenzone (Benzophenone-4) | Up to 10 | UV-B, UV-A II |
| Dioxybenzone (Benzophenone-8) | Up to 3 | UV-B, UV-A II |
| Padimate O7 (Octyl dimethyl PABA) | Up to 8 | UV-B |
| Butyl methoxydibenzoyl methane (Avobenzone, Parsol 1789 ) | 2-3 | UV-A I |
| Meradimate (Menthyl anthranilate) | Up to 5 | UV-A II |
| Titanium dioxide | 2-25 | Physical |
| Zinc oxide | 2-20 | Physical |

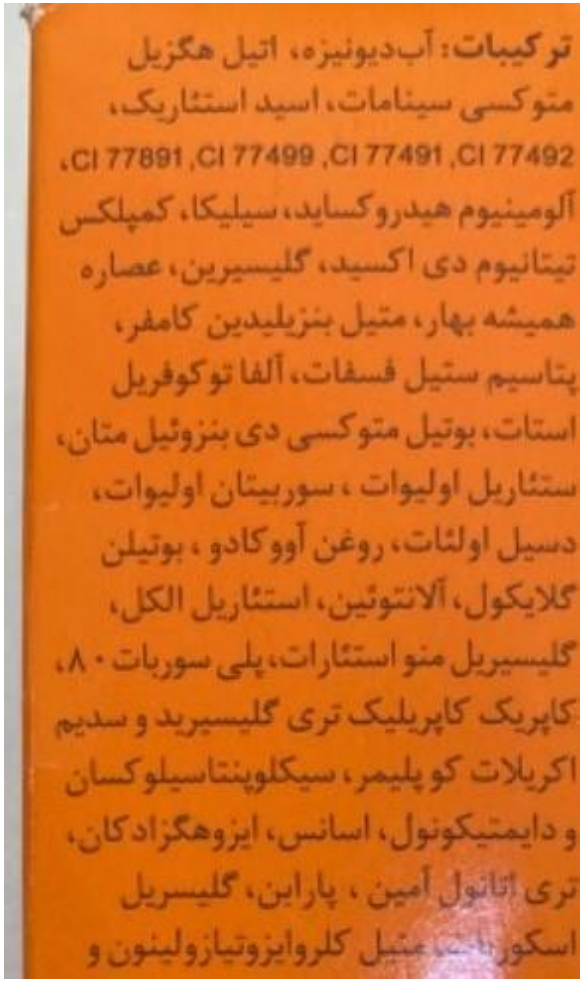
# SYNSHIELD

Ethylhexyl methoxycinnamate, Octocrylene, Avobenzone, Titanium dioxide complex, Polysorbate80. Sorbitan monostearate, Dimethicone, Carbomer940. Triethanolamine, Methylparaben, Propylparaben,

# LAFARRERR

deionized water, ethylhexyl methoxycinnamate, diethylamino hydroxybenzoyl hexyl benzoate, ethylhexyl triazone, glycyrrhiza glabra (licorice) root extract, arctostaphylos uva-ursi (bearberry) leaf extract, saxifraga sarmentosa extract, carica papaya (papaya) fruit extract, psidium guajava (guava) fruit extract, aloe barbadensis (aloe vera) leaf juice extract, bisabolol, allantoin, Na-PCA, sodium hyaluronate, urea, glycerin, sodium lactate, polymethyl methaorviate, butylene glycol,PEG-40hydrogenated castor oil, cetyl alcohol, polysoriate 80, cyclopentasiloxane, dimethicone and phenoyethanol

# دکتر ژیلا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و دایمتیکونول، اسانس، ایزوهگزادکان،
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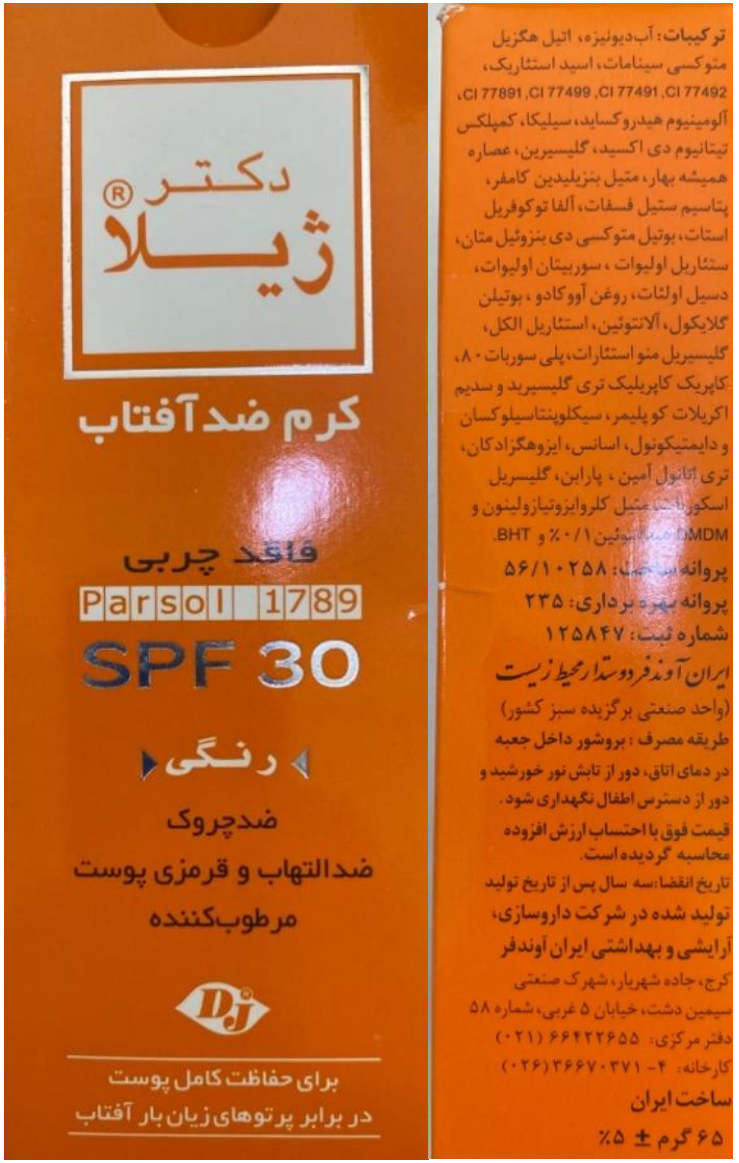
دکتر ژیلا
کرم ضدآفتاب
فاقد چربی
Parsol 1789
SPF 30
رنگی
ضدچروک
ضدالتهاب و قرمزی پوست
مرطوب‌کننده
برای حفاظت کامل پوست
در برابر پرتوهای زیان بار آفتاب
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و دایمتیکونول، اسانس، ایزوهگزادکان،
تری اتانول آمین ، پاراین، گلیسریل
اسکورات، متیل کلروایزوتیازولینون و
MDM هیدانتوئین ۰/۱٪ و BHT.
پروانه ساخت: ۵۶/۱۰۲۵۸
پروانه بهره برداری: ۲۳۵
شماره ثبت: ۱۲۵۸۴۷
ایران آوندفرد وستدار محیط زیست
(واحد صنعتی برگزیده سبز کشور)
طریقه مصرف : بروشور داخل جعبه
در دمای اتاق، دور از تابش نور خورشید و
دور از دسترس اطفال نگهداری شود.
قیمت فوق با احتساب ارزش افزوده
محاسبه گردیده است.
تاریخ انقضا:سه سال پس از تاریخ تولید
تولید شده در شرکت داروسازی،
آرایشی و بهداشتی ایران آوندفر
کرج، جاده شهریار، شهرک صنعتی
سیمین دشت، خیابان ۵ غربی، شماره ۵۸
دفتر مرکزی: ۶۶۴۲۲۶۵۵ (۰۲۱)
کارخانه: ۴-۳۶۶۷۰۳۷۱ (۰۲۶)
ساخت ایران
۶۵ گرم ± ۵٪

# Hybrid formulations

Hybrid formulations employing a combination of chemical absorbers with inorganic particulates may represent a practical compromise.

# New active substances

Pongamol is an active ingredient derived from Karanja Pongamia Extract which enhances UVA protection.

The Karanja Tree grows in India and Australia.

Its round brown seeds are rich in oil, which is widely used for personal care, herbal medicine and agriculture.

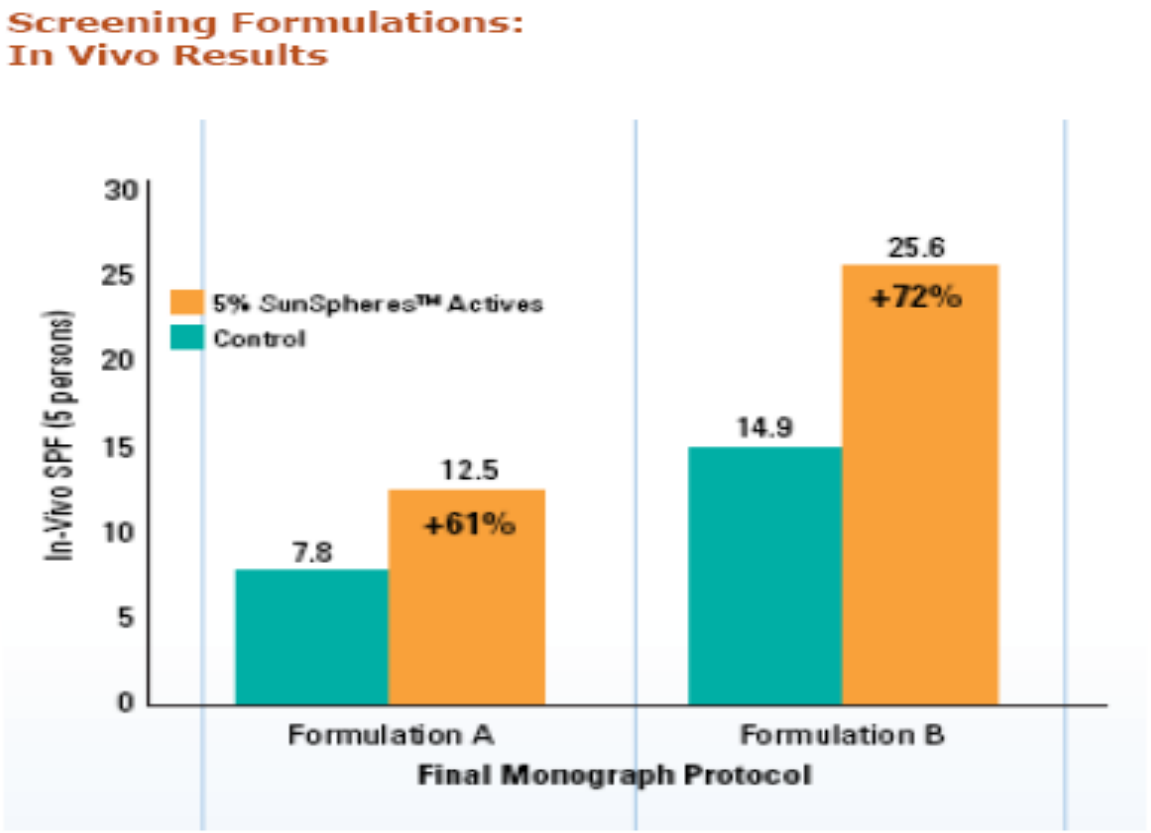
# SunSpheres™ SPF Boosters

SunSpheres™ SPF Booster uses a unique hollow sphere technology to improve the UVB and UVA protection of organic and inorganic sunscreen filters by reflecting UVR.

Hollow styrene/acrylic copolymer spheres approximately 300-400 nm for enhancing UV protection. They are nearly invisible and cannot be felt.

When manufactured, the spheres are filled with water, and remain so until the sunscreen is applied to the skin, when the water migrates out to leave a voided sphere in the product film.

# SunSpheres™ SPF Boosters



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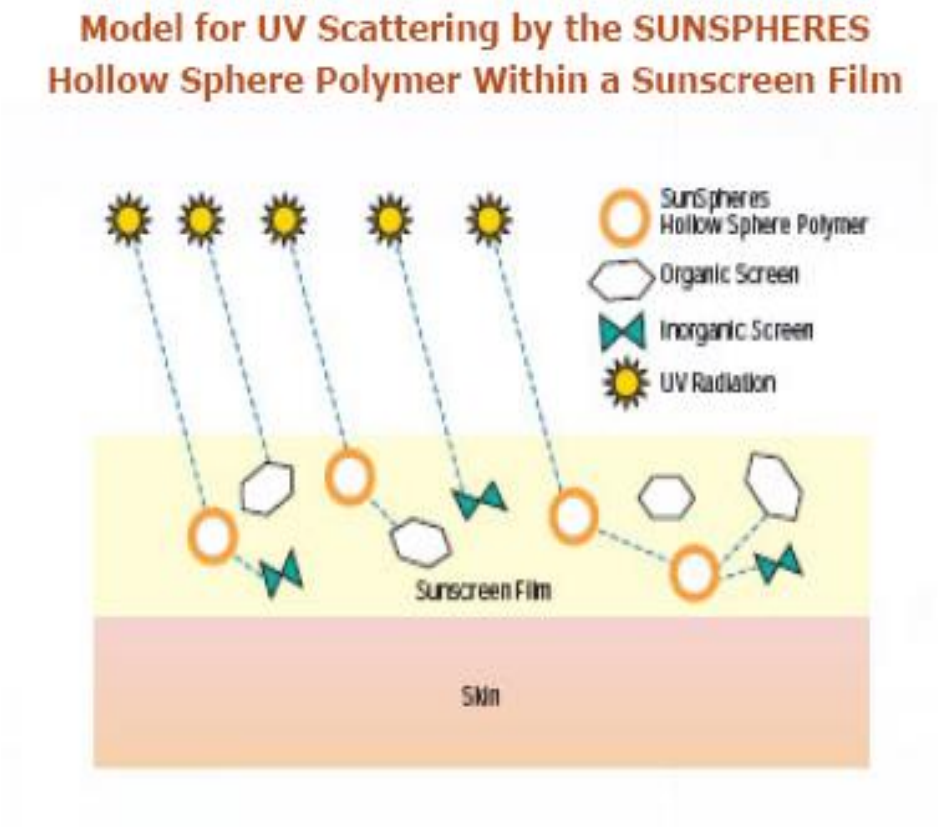


# SunSpheres™ SPF Boosters

**Styrene/Acrylates Copolymer Advantages**

Significantly boosts SPF and across entire UVA and UVB regions

Excellent compatibility with both organic and inorganic UV actives

Compatible with all commonly used sunscreen ingredients

Microspheres impart silky feel in sunscreens

Liquid and powder versions are easy to formulate with and handle

**Recommended Use Levels**

1.0% to 5.0%, solids basis

# SunSpheres™ SPF Boosters

Polymeric shell of the sphere has a refractive index of

1.6 and the air in the core 1.0, which causes any UV energy entering the sphere to exit at a different angle.

The refraction of the UV light increases the path length of the light in the sunscreen layer and increases the possibility of it hitting an inorganic sunblock or an organic sun absorber.

The SunSpheres do not absorb the UV radiation themselves, but the scattering effect optimises the effect of the organic and inorganic constituents of the sunscreen.

The SunSpheres can be used in sunscreen to increase its SPF or to reduce the amount of UVA and UVB absorbers.

# Factors influencing the SPF

Silicones in Sunscreens

Dimethicone is listed in the FDA monograph for Skin Protectants. Because of their hydrophobicity, provide a water resistant barrier against waterborne contaminants. Better spreading, Recent studies indicate that cyclomethicone and dimethicone may also prevent irritation caused by sunscreen agents.

Alkyl methicones can enhance the SPF of products containing either organic or inorganic sunscreens, stearyl dimethicone, cetyl dimethicone.

# Photostability

The ability of a molecule to remain intact with irradiation.

Photostability is potentially a problem with all UV filters.

This issue been raised specifically with avobenzone .

Octocrylene and Tinosorb M, S stabilized avobenzone .

# Adverse effects of sunscreens

The most common skin reaction with sunscreen is irritation, which may include an itchy rash that may lead to eczema and pruritus.

It may cause a non-allergic inflammatory response that is frequently observed in the eye area. Allergic reactions have been observed and more frequently with perfumes, preservatives and other ingredients**.**

PABA and its derivatives, benzophenone, avonenzone and fragrances are among the most allergenic ingredients in sunscreens.

Systemic absorption of some chemical sunscreens like benzophenone-3 (oxybenzone) after topical application to human has recently reported.

Physical sunscreens, generally do not cause skin reactions

# Adverse effects of sunscreens

Eye irritation

Stinging of the eyes is a common side effect experienced after applying a sunscreen. This is most commonly related to irritation of the eyes from the fumes and some chemicals of the preparation.People who encounter this problem should change to a different sunscreen (preferably a physical sunscreen). Any sunscreen can cause irritation if it comes into direct contact with the eyes, as a result of the user rubbing the eyes after applying the preparation, or because the sunscreen is too runny. Water-resistant sunscreens tend to be less runny, and are recommended for the area around the eyes.

# Sun protection

*Protect the Lips*

A sunscreen should be used on the lips. Tumors on the lips are more common in men than in women. The difference was attributed to the widespread use of lipstick by women. The lipstick acts as a filter for the sun’s rays because of the dyes it contains, which function as a physical sunscreen and prevent penetration of the rays to the skin.

*Protect the Neck*

It would be advisable to wear clothing that covers the neck and the upper chest. Excessive sun exposure to these areas causes characteristic features of sun damage with wrinkling.

# The use of sunscreen in childhood

# The use of sunscreen in childhood

In a study demonstrated regular use of sunscreen with an SPF 7.5 for the first 18 years of life could reduce the lifetime incidence of nonmelanoma skin cancers by 78%.

The 1999 FDA Final Monograph recommends that physicians should be consulted for the use of sunscreen in children under 6 months of age, because their physiologic systems for metabolism and excretion of absorbed agents may not be fully developed.

# ضد آفتابهای مناسب کودکان

از محصولاتی که روی آنهابر چسبهای

بدون مواد تحریک کننده non-irritating

یا بدون عطرمواد خوش بو کننده  fragrance free

و یا ضد حساسیت hypoallergenic

نوشته شده استفاده نمایید.

فیزیکال

بدون مواد بنزوفنون، پابا

# Sun Protection Factor (SPF)

Sun Protection Factor (SPF) of a sunscreen represents the effectiveness of the sunscreen in protecting against UVR-induced erythema. The sunscreen is spread on the skin which is then exposed to UV. The SPF is the ratio between the UV dose required or time to produce the minimal erythematous reaction while using sunscreen and the UV dose or time needed to produce the same reaction without the sunscreen, after the application of 2 mg/ $cm^2$ of the sunscreen product.

In this equation:

$$SPF = \frac{MED(PS)}{MED(US)}$$

MED(PS): Minimum erythemal dose for protected skin

MED(US): Minimum erythemal dose for unprotected skin

# SPF

The SPF of a sunscreen is determined by its ability to prevent the appearance of reddening of the skin following exposure to the sun (UVB).

However, that does not necessarily tell us how effective the sunscreen is in preventing the appearance of malignant tumors on the skin, or its ability to prevent damage to the skin.

In any case, it is also necessary to be strict and to apply sunscreens together with avoiding exposure to the sun.

# Sunscreen potency assessment by the FDA, based on sun protection factor (SPF)

| **Sunburn protection** | **SPF** |
|---|---|
| *Minimal* | *2 - 12* |
| *Moderate* | *12 - 30* |
| *High* | *≥ 30* |

# SPF determination

SPF determination by *in vivo* methods

SPF determination by *in vitro* methods

*In vivo* SPF testing is carried out on the skin of the backs of human volunteers having skin type's I - III. There are some differences between FDA, Australia/New Zealand and COLIPA standards.

# Skin type and sunburn and tanning history

I. Always burns easily; never tans.

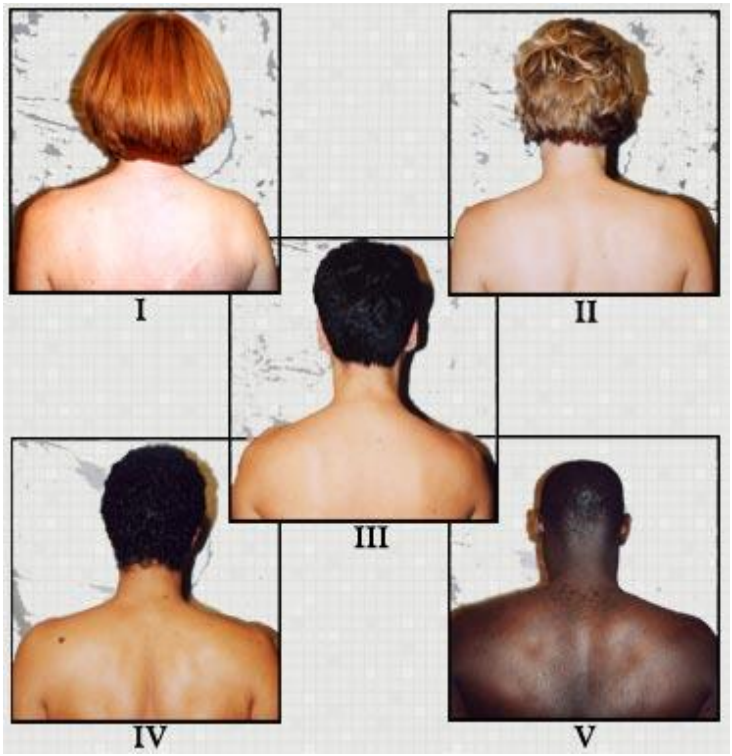
II. Burns easily; tans minimally.

III. Burns moderately; tans gradually.

IV. Burns minimally; always tans well.

V. Rarely burns; tans profusely.

VI. Never burns; deeply pigmented




# SPF determination according to Australian standard by *in vivo* method

10 subjects: male or female without a history of abnormal response to medication and UVR

No allergies to topically cosmetics.

Shouldn’t take photosensitizing medications.

Skin type shall be type I - III.

Darker skin are not suitable because of the long time. The results obtained from any skin type are similar, only the exposure times will differ.

The test site is located on the subject’s back without hair. Test sites have a minimum area of 30 $cm^2$.

## 3 Days:

First day the MEDUPS is determined;

Skin type I, MED or exposure time is probably ≤9 sec.

Skin type II is ≥10 seconds and ≤ 13 sec.

Skin type III is ≥ 14 seconds.

The day after, 16-24 h after exposure MED shall be observed.

The observer shall select the subsite estimated to be the first one to show a minimal redness perceptible to the eye, when corrected for normal vision.

The test site shall be divided into at least 5 subsites to avoid overlap of radiation.

The product and reference applied 2.0 ± 0.1 mg/cm$^2$. The product has to spread with uniform thickness with finger-stall.

Dry for 15 min.

Each subsite exposes to controlled amounts of simulated sunlight using a solar simulator. From one to the next, the exposure time should increase by a constant ratio.

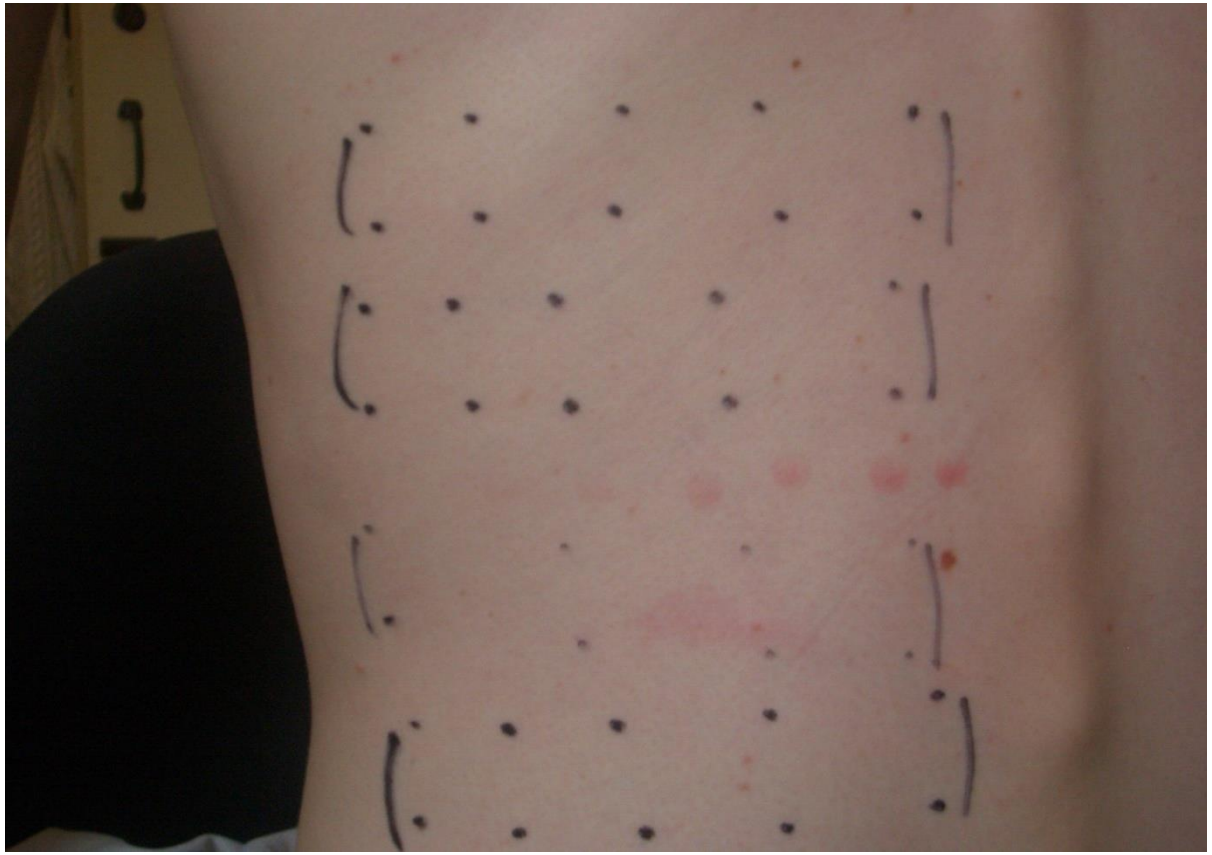
If the estimated SPF is less than 25, increments between subsequent exposures will be not greater than 1.25 times and for estimated SPF more than 25 this will be 1.1 times.

For example if the MED of a person is 6 seconds and the estimated SPF is 15, the exposure time is 57, 72, 90, 112 and 140 sec.

In third day: MED will observe.

The FDA Homosalate Standard (SPF= 4 - 5) and P3 Standard with SPF (12.5 - 18.5) is used as references.

The MED observed 20 h after UV exposure from UV source of solar simulator to a subject with the skin type II. The forth erythema from right is MED.



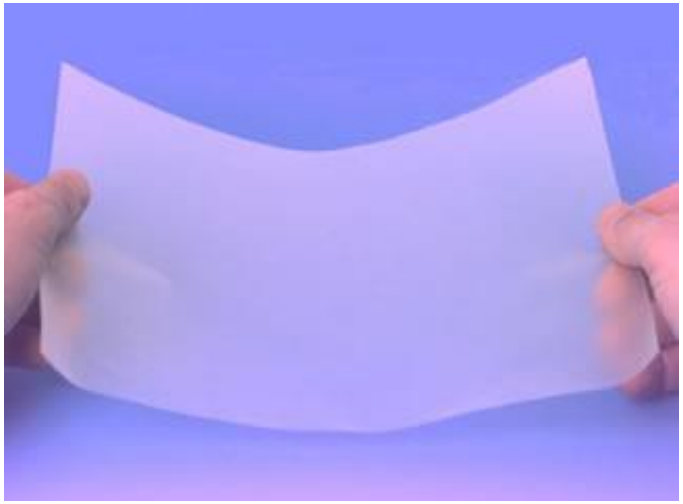
# SPF determination by in vitro methods

Diluted solution transmittance method

Thin film transmittance method

Substrate method

- Transpore tape
- Vitro-Skin
- Polyvinyl Chloride films

# Evaluation of UVA radiation

*In vivo*

*In vitro*

*(Broad Spectrum)*

# PA system

The Protection Grade of UVA (PA).

According to the Japan Cosmetic Industry Association PA+ corresponds to a UVA protection factor between two and four, PA++ between four and eight, and PA+++ more than eight.

# Evaluation of UVA radiation

Boots star rating system (UK):

*In vitro* measurement of the ratio of a product's UVA (320-400 nm) absorbance over its UVB (290-320 nm) absorbance is used to calculate its Boots star rating.

Products with better UVA absorbance have a higher Boots star rating.

## BOOTS STAR RATING SYSTEM

### The Boots guideline for star rating

The Boots star rating is based on the average of UVA/UVB ratio. A different rating is given to a range of values as shown below. Rating levels differ for different wavelength sampling intervals.

| Mean UVA/UVB Ratio | Star Rating Category | Star Rating Designation |
|---|---|---|
| 0 to 0.2 | - | No claim |
| 0.21 to 0.4 | * | Minimum |
| 0.41 to 0.6 | ** | Moderate |
| 0.61 to 0.8 | *** | Good |
| 0.81 to 0.9 | **** | Superior |
| 0.91 and above | ***** | Ultra |

# Evaluation of UVA radiation

You may see the phrases 'multi spectrum', 'broad spectrum' or 'UVA/UVB protection' on sunscreen labels, and these all indicate that some UVA protection is provided.

However, because there is no consensus on how much protection these terms indicate, such phrases may not be entirely meaningful.

# Choosing an appropriate SPF

Many doctors now recommend using preparations containing an SPF of 30 or greater. For people with skin type 1 or 2, and for certain people at high risk (such as those with an increased risk of skin tumors), a preparation with an SPF of over 30 may be necessary.

The recommended SPF depends not only on people’s skin types, but also on the length of time they intend to be in the sun.

# How to apply the sunscreen

Sunscreen, daily and all seasons to all over the skin, 15 – 30 min before going outdoors, even on cloudy days (up to 80 % of UVR still reach the earth's surface).

Reapply every 2 or 3 h, or after swimming, sweating and rubbing or towel. Reapply all sunscreens even if the label says waterproof (3 to 4 h).

Sunscreen reapplication can maintenance an adequate thickness. It does not extend the period of protection or double the SPF.

Consumers apply between 0.5 and 1.5 $mg/cm^2$, then an effective SPF is between 20% and 50% of expected from the product label.

Sunscreen needs to be applied liberally and generously.

Apply even at home.

سطح پوست صورت ۶۰۰ سانتی متر مربع

۱/۲ گرم برای پوشاندن صورت معادل یک بند انگشت

2FTU: 1g


# The thickness of a sunscreen



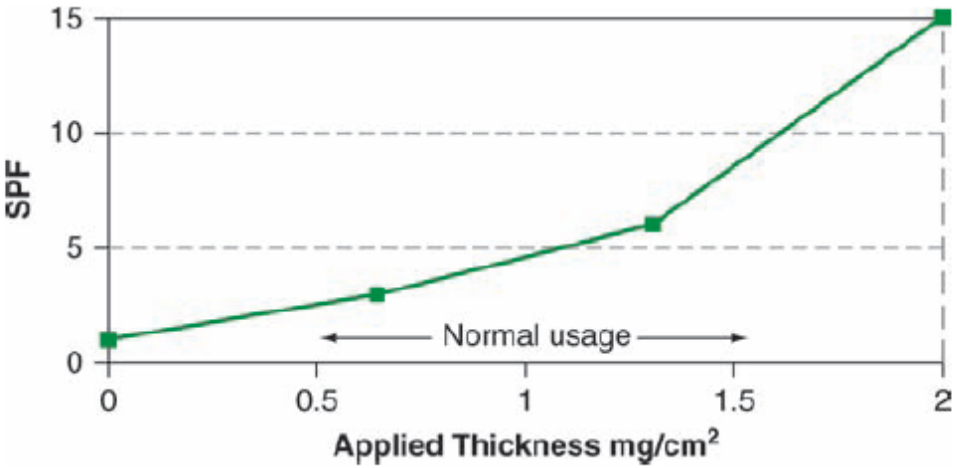



**Figure 2** The variation of delivered SPF with application thickness for a sunscreen of nominal SPF 15 (41). *Abbreviation*: SPF, sun protection factor.

# How to apply the sunscreen

The accepted recommendation is to apply the sunscreen 15 to 30 minutes before going out into the sun (so that it has time to penetrate into the keratinous layer of the skin) and then once again, 15 to 30 minutes following exposure to the sun.

It has been shown that most people use inadequate quantities of sunscreen and apply it unevenly, leaving unprotected areas of skin. As the surface of the skin is nonuniform, applying two coats.

Apply chemical sunscreens that need to be absorbed first, barriers (like moisturizers, makeup, and physical block sunscreens) last.

Note: No sunscreen is 100% effective. The term “sunblock” is prohibited.

# آیا مصرف کرم ضدآفتاب روی پوست اطراف چشم اشکال دارد؟

خیر. مالیدن ضدآفتاب روی پوست پلک تحتانی و اطرا ف چشم نه تنها ایراد ندارد بلکه ضروری است. زیرا پوست دورچشم نازک بوده بیشتر درمعرض عوارض ناشی ازآفتاب است.پوست پلک فوقانی نیاز به ضدآفتاب ندارد.برخی بدنبال مصرف ضدآفتاب به پوست اطراف چشم دچار اشک ریزش میشوند.اینها بهتر است از ضدآفتابهای فیزیکال استفاده کنند. آردن ۳۰ دور چشم دارد

پوست دور چشم چربی کمتر داشته و بیشتر آسیب می بیند.

برخی ضد آفتابها باعث ایجاد حساسیت در پوست دور چشم می شوند (پارابن ها و اسانس ها)

# Water Resistance Property

A water-resistant product maintains its SPF (loss less than 25%) level after 40 min of water immersion, and a very water-resistant (waterproof) product maintains the SPF (loss less than 25%) level after 80 min of water immersion.

**تهیه کننده: دکتر محمدباقر رستمیانی**

**کارشناس آرایشی و بهداشتی معاونت غذا و دارو نیشابور**

**دریافت جدیدترین مطالب آموزشی در حوزه سلامت از طریق:**

**سایت معاونت غذا و دارو نیشابور :** https://vcfda.nums.ac.ir/

**صفحات اطلاع رسانی معاونت غذا و دارو نیشابور در فضای مجازی:** @numsifda