Sunscreens

واقيات الشمس

Done By Mariam Yacoub

Saja Hamed, Ph.D

WHY WORRY ABOUT TOO MUCH SUN ? ? ?

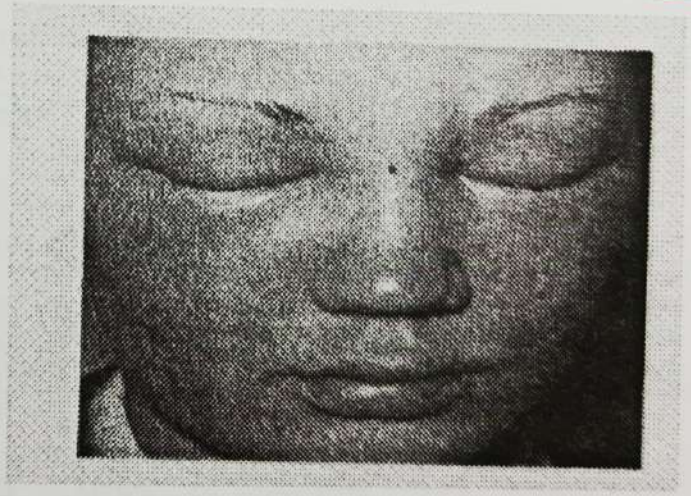
في هذا الجزء تأثيرات ضارة نتيجة التعرض الزائد لأشعة الشمس

THE EFFECTS OF UV EXPOSURE:

1. **SUNBURN**

Involves skin redness, tenderness, swelling and blistering.

أول تأثير الكوعه الناتجة من الشمس والمتمثلة بـ احمرار وتورم وتقرحات .

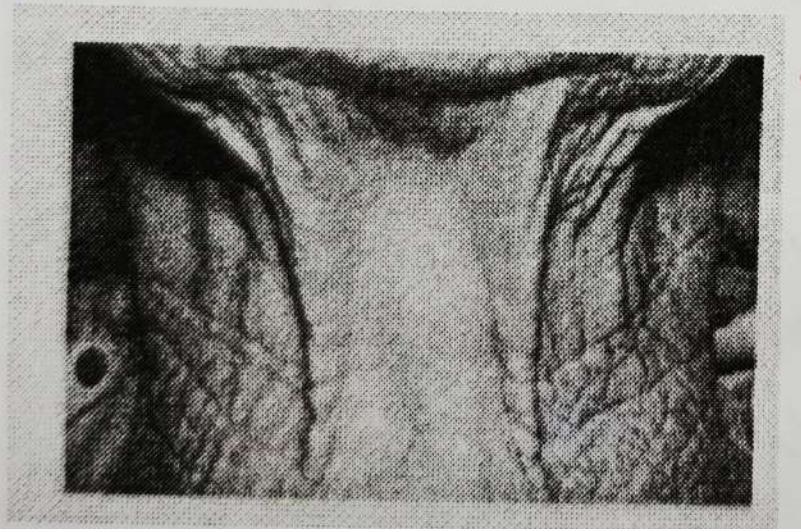


(Atlas of Skin Cancer Pg: 155, 1991)

EFFECTS OF UV EXPOSURE (CONTD...)

(2) ▪ **PREMATURE SKIN AGING**

Too much exposure to sun can change the skin texture giving it a leathery appearance and causing discoloration.



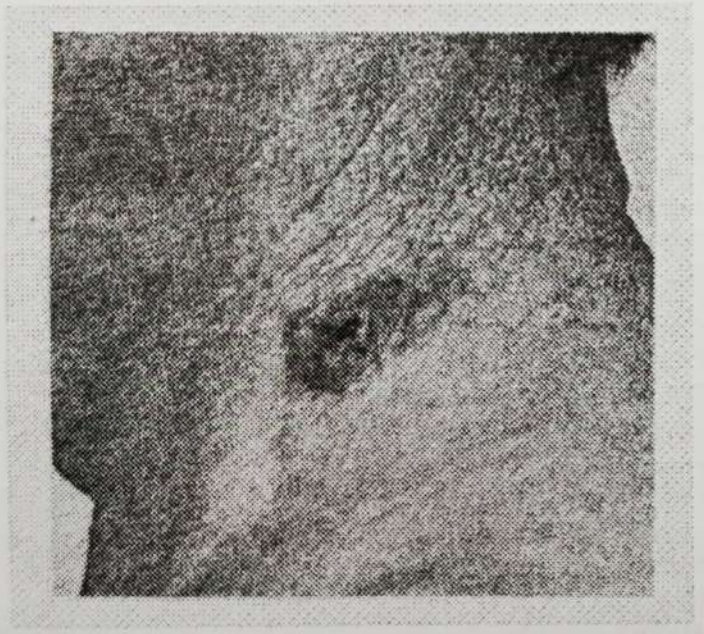
(Atlas of Skin Cancer Pg: 158, 1991)

EFFECTS OF UV EXPOSURE (CONTD...)

3. SKIN CANCER

Exposure to the sun and severe sunburns can lead to skin cancer.

skin cancer کی قسم



Basal Cell Carcinoma. A large cystic basal cell carcinoma is present in an area of chronic sun damage.

(Atlas of Skin Cancer Pg:158, 1991)

أعلنت الـ CDC أن السبب الرئيسي لـ Skin cancer هو التعرض لـ UVA سواء من الشمس أو indoor tanning

- The CDC states that: 'A majority of skin cancers are caused by exposure to ultraviolet(UV) radiation from the sun or from indoor tanning devices, and are, therefore,preventable. Evidence clearly links exposure to UV radiation and a history ofsunburn (indicating both intensity of UV exposure and skin sensitivity to radiation)to an increased risk of skin cancer'.

تكون حاطيت منه نسبة UVA أعلى من الموجودة بالشمس بـ ٣٠ مرة !

Osterwalder, U., Sohn, M. and Herzog, B. (2014), Global state of sunscreens. Photodermatol. Photoimmunol. Photomed., 30: 62-80. https://doi.org/10.1111/phpp.12112

EFFECTS OF UV EXPOSURE (CONTD...)

4. **SUN SENSITIVITY**

Development of hives, blisters or blotchy areas as an allergic reaction to sun exposure.

5. **IMMUNE SYSTEM SUPPRESSION**

Damages the immune system making the body vulnerable to infections and cancer.

Simple tips for sun safety from the American Cancer Society (ACS) include:

1. Do not use tanning booths, beds or lamps. These devices do not provide a 'safer way' to tan.
2. When outdoors, stay in the shade whenever possible – particularly between the hours of 10:00 am – 4:00 p.m. when the sun's rays are most intense.
3. Wear sun protective clothing such as a long-sleeved shirt, a wide-brimmed hat and UV protective sunglasses.
4. Use a broad spectrum sunscreen with an SPF of 30 or higher on all skin that is not covered every day, even on a cloudy day.
5. Reapply sunscreen every two hours or immediately after swimming or sweating.
6. Visit your healthcare professional every year for a skin exam.

http://www.cosmeticsinfo.org/products/sunscreens-how-read-label-expert-tips-etc

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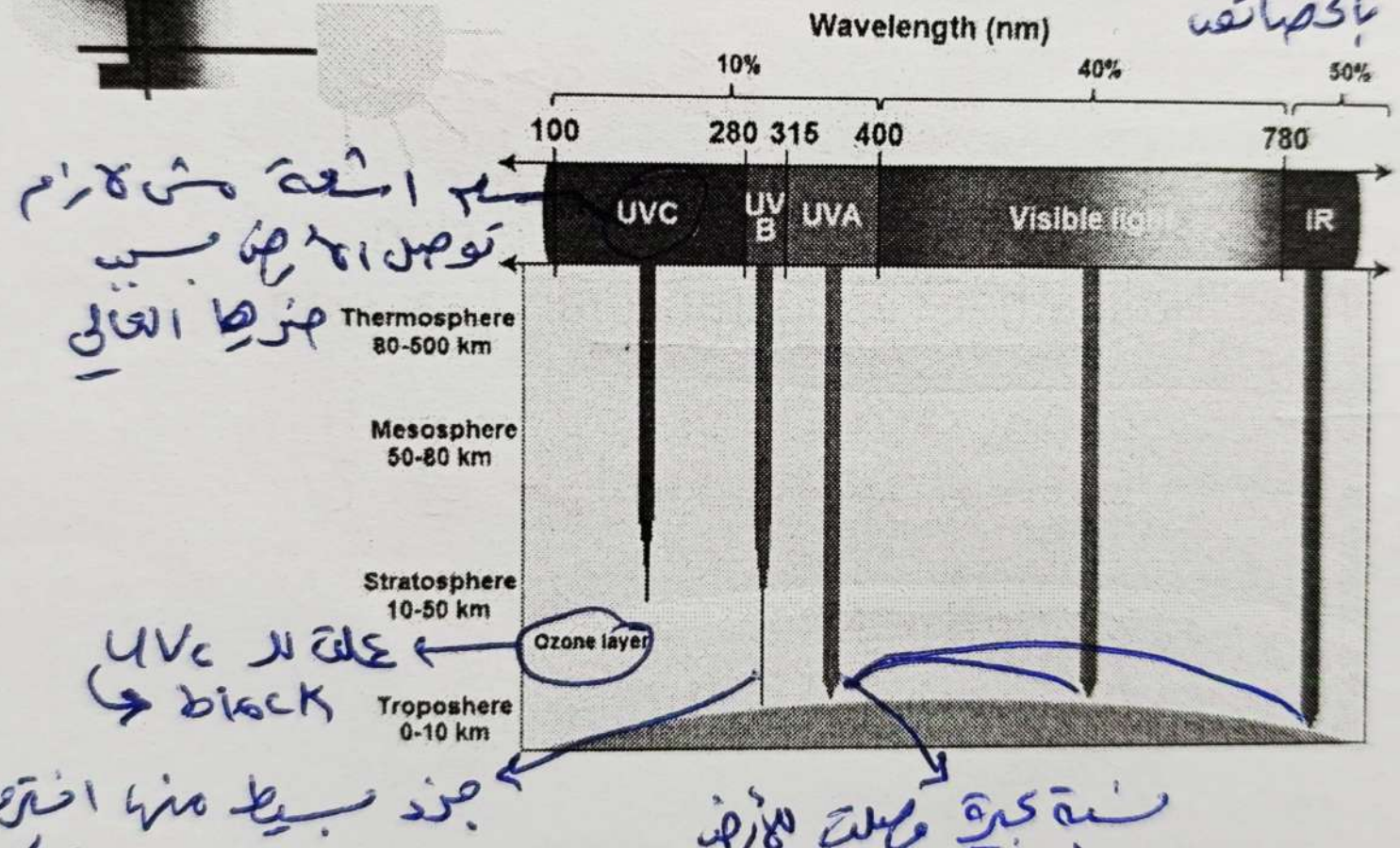
مجموعة واسعة من الأطوال الموجية تختلف بالخصائص



هي اشعة مش كلام توصل الأرض بسبب حزمها العالي

علق لا UVc ← block

جزء بسيط منها اخترق طبقة الأوزون

نسبة كبيرة وصلت للأرض

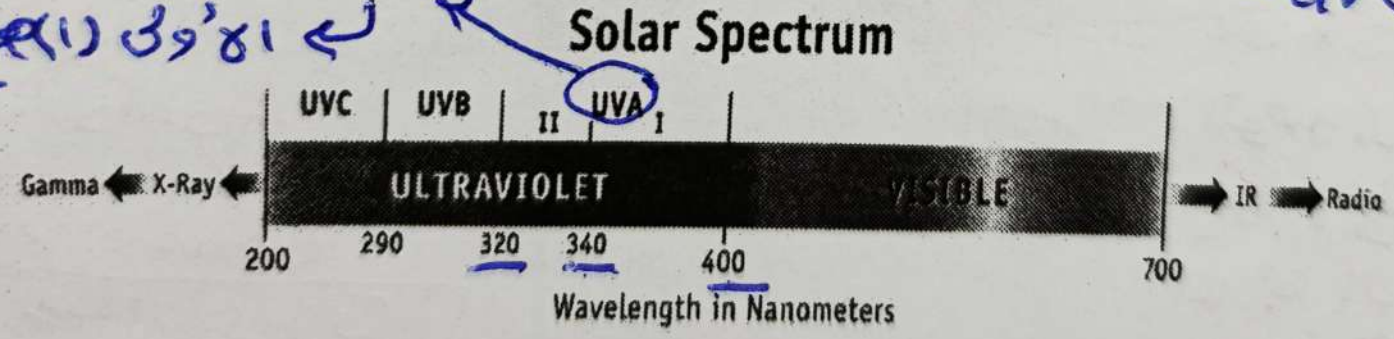
Intern J of Cosmetic Sci, Volume: 37, Issue: 1, Pages: 2-30, First published: 25 September 2014, DOI: (10.1111/ics.12165)

* لكن مع وجود ثقب الأوزون في نسبة كبيرة من أشعة الضارة بتدخل للأرض وبتعمل مشاكل مثل السرطان .

PHOTOBIOLOGY

- INFRARED RAYS IR — 700nm - 1000nm
- VISIBLE RAYS — 400nm - 700nm
- ULTRAVIOLET RAYS UV — 200nm - 400nm
  - UVA (320-400)
  - UVB (290-320)
  - UVC (200-290)

2 Region



Energy

عمو اينشتاين الله يسامحه وبيفضله حكى إنه
في علاقة عكسية بين الطاقة والطول الموجي

- Einstein's equation
  - $E = h\upsilon = hC/\lambda$
    - h is Plank's constant = 6.625×10^{-34} J-s
    - υ = frequency
    - λ = wavelength
    - C = speed of light = 3×10^{8} m/s
- Energy is inversely proportional to λ
- Longer wavelengths are lower energy

skip

لو بدي أطلقهم على موجات الـ UV ← الـ UVC هي الأقصر ← طاقة أكتر. النهاية مش لازم توصل الأرض.

- أما UVA هي الأطول = طاقة أقل.

Energy of radiation at various wavelengths

الفكرة كلون توضيح للطاقة العكسية بينه و بين energy

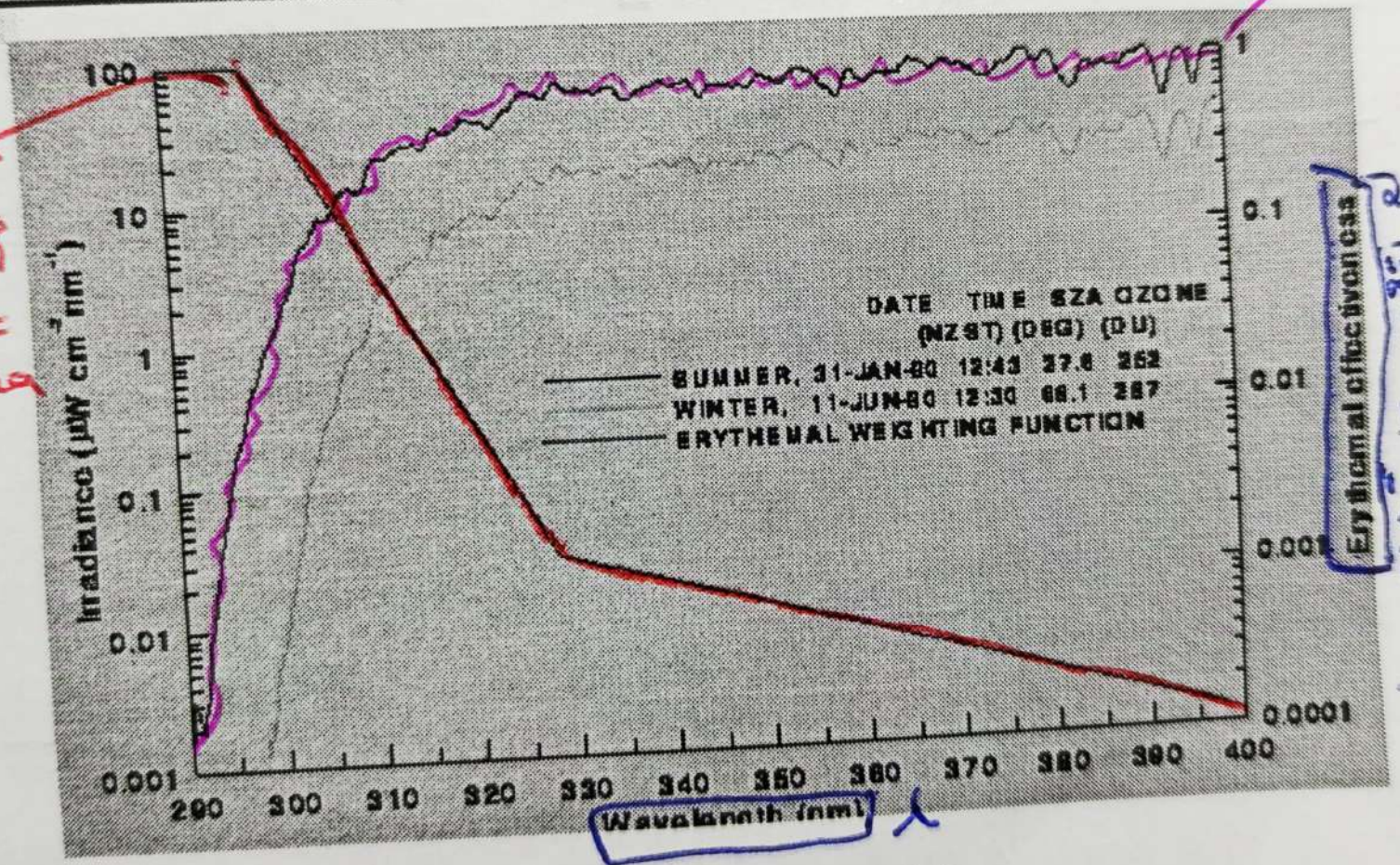
Table 31-1 The Energy Associated with Quanta of Visible and Invisible Wavelengths

	"Color"	Wavelength (nm)	Energy in kcal/mol	Approximate Energy per Photon in eV
Invisible UV	X-ray	.001	$>28 \times 10^6$	$>12 \times 10^6$
	UVC	200	143	6.2
	UVC	250	114	5.0
	UVB	280	102	4.4
	UVB	300	95	4.1
	UVA	360	79	3.4
Visible	UVA/violet	400	72	3.1
	Violet	420	68	2.9
	Blue	470	60	2.6
	Green	530	54	2.3
	Yellow	600	47	2.0
	Orange	630	45	1.9
	Red	700	41	1.8
Invisible IR	Near infrared	1000	29	1.2
	Far infrared	10^5	.29	.012

كلما تزيد الطاقة

كلما الطول الموجي

Solar irradiance and the erythema action spectrum (red line)



energy.
الإشعاع أقل λ
erythema على أعلى =

الإشعاع كان
أطول λ
أقل =
erythema

لما بتكبر كل قيمة
طاقة وبتناسب عكسيًا
مع λ wavelength

. أي surface أو skin على سطح الجلد

Light that encounters the skin surface reflected, refracted and scattered.

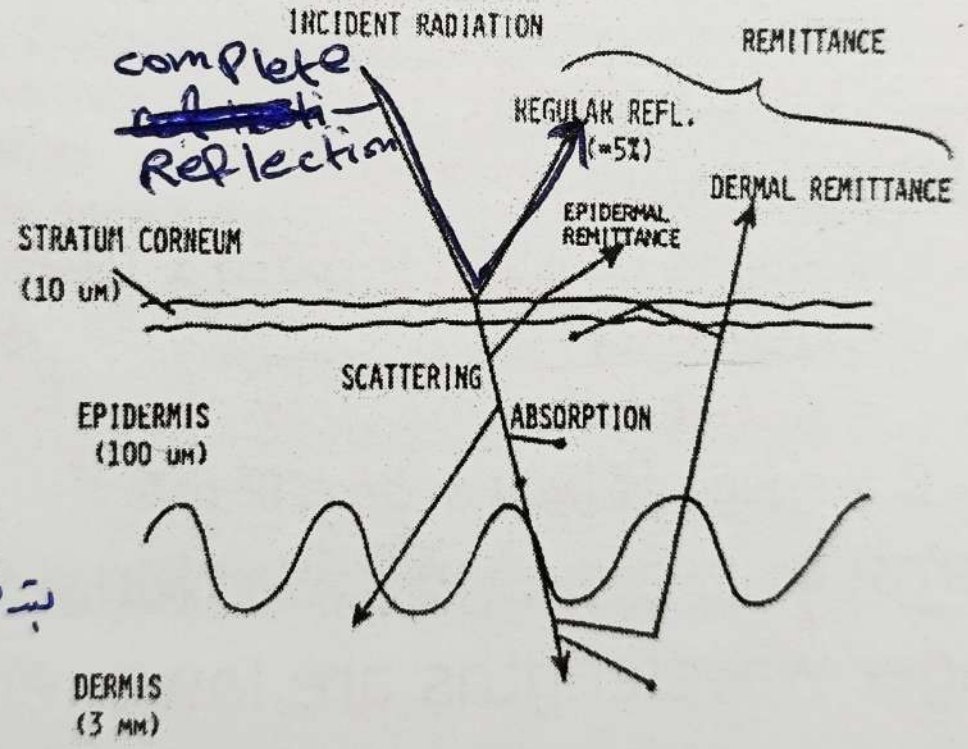


Fig. 31-3 Schematic diagram of optical pathways in skin.

* مصير الأشعة لما تيجي عالجلد :-

1. complete Reflection

2. Refraction لما بتدخل الجلد بزاوية مختلفة

3. Scattering تشتت في أماكن مختلفة

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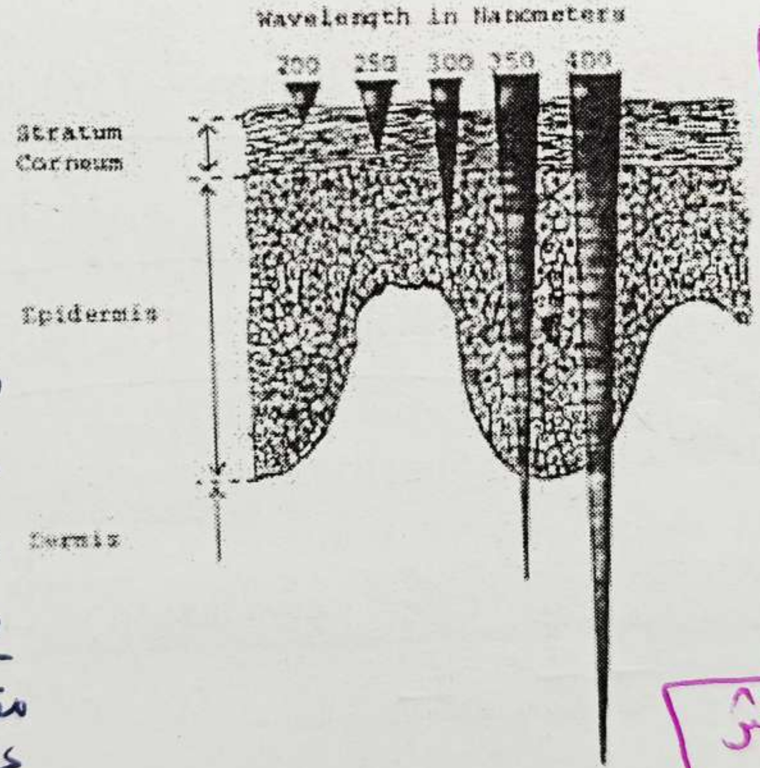
is

(Penetration)

Scattering is inversely proportional to the 4th power of λ so longer wavelength penetrate deeper

* يوجد علاقة عكسية بين
الطول الموجي وال Scattering
لهيك عنا ال UVA هي الأطول
و أقل scatter يعني قادرة
على الاختراق أكثر ومثلاً هي
بتوصل لل Dermis وبتأثر ع الكولاجين
فيها ، بينما UVB تعتبر أكثر scatter
مقارنة بال UVA وكأنها بتوصل بس لل
SC + epidermis و بتكون محرضة
للاحتراق اكثر لهيك بسموها
Burning rays.
لما ال UVA بسموها Aging rays.



Concept

λ أطول = scatter أقل
= Penetration أعمق

as UVA
بتوصل لل collagen + elastin
⇓
Aging rays.

Concept

λ أقصر = scatter أكثر
= Penetration أقل

as UVB
بس بتوصل SC + epidermis
⇓
Burning rays.

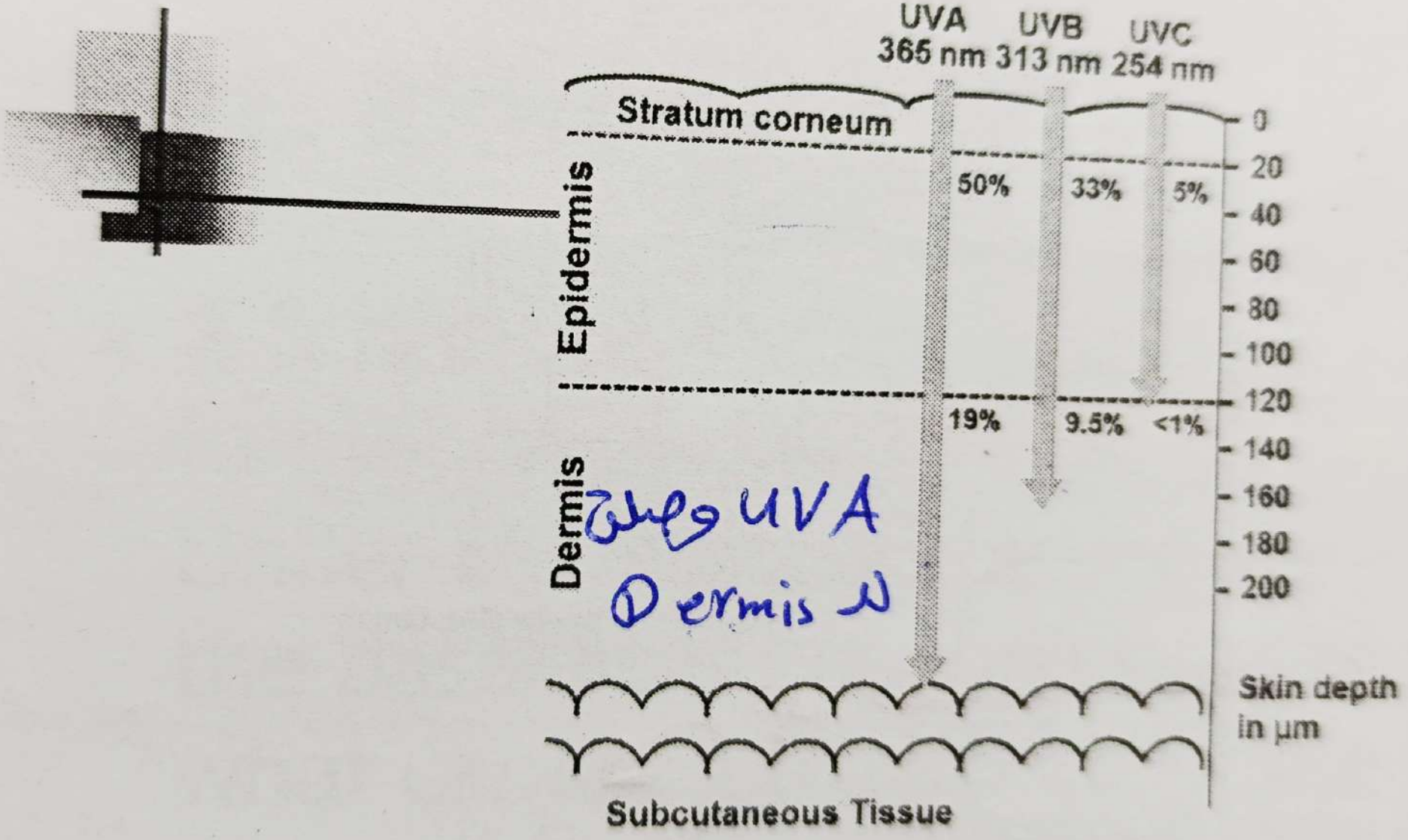
Key Concepts

* كل نوع أشعة وكيف بحس فيها

- humans sense IR radiation as heat and VIS radiation optically, UV radiation is not directly perceivable. invisible
  - Depending on the wavelength, UV radiation can be divided into UVC (200–280 nm), UVB (280–315 nm) and UVA radiation (315–400 nm).
  - Only part of UV radiation reaches the surface and depends on the location, the season, the clouds, the air pollution and the humidity
  - The majority of UVC and UVB radiation is absorbed by oxygen and ozone in the atmosphere. On average, approximately 20 times more UVA rays than UVB rays reach the earth's surface

Key Concepts

- Due to their different wavelengths, UV rays can penetrate the skin to different depths and can cause cellular changes.
- UVB mainly penetrates the epidermis burning rays
- UVA penetrates deeper into the skin down to the dermis Aging rays.


UVA
365 nm
UVB
313 nm
UVC
254 nm
Stratum corneum
Epidermis
Dermis
50%
33%
5%
19%
9.5%
<1%
0
20
40
60
80
100
120
140
160
180
200
Skin depth
in µm
Subcutaneous Tissue

pects

Key Concepts

- In addition to natural sources, artificial sources must also be mentioned.
- Except for occupational exposure, sun lamps and tanning beds are the most common source of artificial UV light in everyday life.
- Commercial tanning beds emit high UVA levels and variable amounts of UVB (1–5%).
- Some EU countries, including Germany, the United Kingdom and Austria, have adopted legal provisions that prohibit adolescents under 18 years from indoor tanning

من الأمثلة على وجود أشعة، كما تأتي من الشمس

يمكن أن يكون عبارة عن أكثر من ضعف UVA من أشعة الموجودة بالشمس.

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Sunscreen testing and classification

Key Concepts

- balanced exposure to sunlight is essential to make optimal use of positive health effects without unnecessarily burdening the skin.

لازم يكون في balance بتعرضي لأشعة الشمس
وأرضي لإشي وقت الصباح وقبل الغروب لحتى أحصل
على ال Positive effects بدون أضرار .

Sunscreen testing and classification

UVB + UVA المقارنة بين

UVB	UVA
• Wavelength 290–320nm • Most are intercepted by the ozone layer but with the depletion of the ozone layer more UVB rays are now reaching the earth's surface • Its intensity varies by season, location, and time of day but in the summer months it is most intense between 10 am and 4 pm • At high altitudes and surfaces such as snow and ice, up to 80% of UVB rays are reflected so they hit the skin twice • The main cause of skin reddening and sunburn and damages the upper epidermal layers of skin • 20-30 minutes of UVB exposure a day helps the skin to produce bone-building vitamin D3 • Suppresses skin immune function	• Wavelength 320–400nm • UVA I 340–400nm • UVA II 320–340nm • Accounts for up to 95% of UVL reaching the earth's surface • Present with relatively equal intensity throughout the year • Can penetrate clouds and glass • Penetrates the skin more deeply than UVB rays and damages skin cells in the basal layer of the epidermis • Responsible for causing a deep tan which is an injury to the skin's DNA • Contributes to and may even start the development of skin cancers • Suppresses skin immune function

ثقب الأوزون

ما تتأثر بال season

سلبية

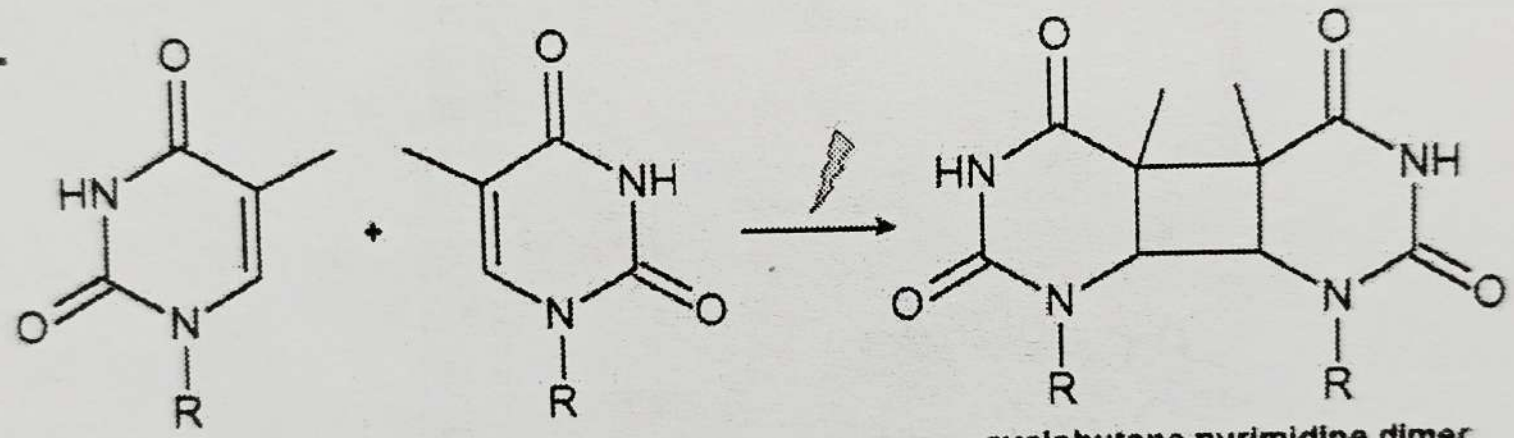
مشتركة

توصل خلايا dermis المعروفة بال Melanocytes وتتحفز تكوين الميلانين كـ response لعابد inflammation

https://dermnetnz.org/topics/sunscreen-testing-and-classification

UVB radiation

- 280-320 nm
- Mainly penetrates the superficial skin layers (epidermis)
- Major cause of sunburn
- Leading factors of skin cancer
- Immediate result on skin is skin redness and thickening of SC (defense reaction)
- Responsible for the synthesis of vitamin D in the skin
- Do not significantly penetrate glass



cyclobutane pyrimidine dimer

كيف بتسبب الـ UVB ← cancer

UVB radiation has a strong carcinogenic effect. It causes direct damage to the DNA and RNA and leads to the generation of thymine–thymine cyclobutane pyrimidine dimers (TT-CPDs) and pyrimidine–pyrimidine (6-4) adducts (6-4 PPs)

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exposure to UV light → decrease activity of anti oxidant enzyme → Repeated exposure to UV light → damage to the skin tissue → skin cancer

UVA radiations

- 320-400 nm
- Penetrate deeper into the skin, down to the dermis. Penetrate window glass (UVB يحجب الـ / ما يتأثر بالـ cloud)
- Short term effect: skin tanning (indoor tanning)
- Tanning cause cumulative damage leading to photo aging
- UVA radiation leads to a balance shift towards the collagen-degrading matrix metalloproteinases (MMPs) as collagenases. (تسبب تكسير الكولاجين)
- UV radiation leads to a decrease in antioxidant enzymatic activity in cultured fibroblasts, and repeated UV exposure before enzyme activity fully returns can lead to additional damage to the skin tissue (يزيد تشكيل الـ ROS)
- UVA damages keratinocytes in the basal layer → may cause skin cancer
- Weaken the immune system
- Photosensitivity reactions are also mediated by UVA
- Indoor tanning (can emit doses up to 12 times that of sun)associated with increased risk of skin cancer and the risk is higher with use in early life

Natural photoprotection of the skin

- The most important protection is the pigmentation of the skin by formation of melanin which acts as radical scavenger and ensures light absorption up to the visible range.
- UVA radiation is mainly responsible for the immediate and persistent pigment darkening (IPD and PPD) by photooxidation of melanin precursors, which are already present in the skin
- UVB radiation results in delayed tanning reaction (DTR). Pigment formation takes place in the basal layer and is based on the proliferation of specific enzymes, especially tyrosinase.

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Natural photoprotection of the skin

① Melanin
② UV-induced hyperKeratosis
③ Repair enzyme / ④ Enetogenous Redox system

- A further protection mechanism is the formation of the UV-induced hyperkeratosis. Under UV radiation (especially UVB light), the basal cells are stimulated to proliferate what causes a thickening of the horny layer. Without further exposure to UV radiation, the hyperkeratosis disappears

SC

بتحفز الـ SC إنها تزيد من الـ Proliferative و بتخلي سميكة Basal cells و بتروح بمجرد ما راحت أشعة الـ UV

(Defense Mechanism)

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Natural photoprotection of the skin

DNA damage أنزيمات بتتعرف على أماكن وجود
وبتصلحها Repair ← وإذا ما تصلحت ← Apoptosis

- There are also repair enzymes that are able to identify, cut and replace faulty DNA sequences. For strongly damaged cells – so-called sunburn cells – apoptosis can be initiated as a protection mechanism.
- And there are endogenous redox systems, such as ubiquinone, glutathione and α-lipoic acids, which have an antioxidative effect and react with free radicals before they can damage other cell constituents, such as lipid membranes, proteins and nucleic acid. However, the quantities of these substances produced by the body itself are rapidly depleted under UV radiation by the formed ROS.

ERS

(1) (2) (3)

مواد الـ ERS بترتبط مع الـ ROS الناتجة من التعرض لـ UV وبيمنعوا انه يعملوا ضرر للجلد / لكن للأسف هاي المواد الحمايتها في الجسم بتروح بجود كتعرضنا للـ UV

Natural photoprotection of the skin

٤ أنواع حكيناهم سابقًا

- As natural skin protection becomes ineffective after a short time (depending on the skin type, between 10 and 40 min) other protection measures are needed:
  - avoidance of direct midday sun,
  - wearing protective clothes and sunglasses,
  - and usage of appropriate sun protection products sun screen

بيطلعوا فعالين وبعد فعالين بعد مرور ١٠ - ٤٠ دقيقة لهيك لازم نعمل

Natural photoprotection of the skin

- Tanning is not healthy. It is a sign of skin damage
- DNA damage and cellular damage that can lead to photocarcinogenesis

Sunscreen Definitions

- **Erythema**: Redness that appears within a few minutes of sun exposure.
- **Sunburn:** Erythema that appears after sun exposure and then fades after several days. Skin may peel or in extreme cases blister.
- **MED** The minimum dose of UV required to produce visual erythema on a given individual.
- **SPF**: Sun Protection Factor: The ratio of the MED after the application of sunscreen to the MED before application.
- **IPD**: Immediate Pigment Darkening: a clinically visible brown pigmentation within the boundaries of a square produced immediately after irradiation (UVA)
- **PPD:** a clear pigmentation 3 h after irradiation (UVA)
- **DT**: Delayed Tanning, occurs a few days after exposure. (UVB)

التصنيف حسب الحساسية للشمس

Skin type	Unexposed buttock skin	Sun sensitivity and pigment response*	UVB MED (MJ/cm²)
I	White	Always burn easily, tan little or none	20-30
II	White	Always burn easily, tan minimally with difficulty	25-35
III	White	Always burn moderately, tan average (light brown)	30-50
IV	Light brown	Burn minimally, exhibit IPD, tan easily (moderate brown)	50-75
V	Moderate brown	Burn with difficulty and minimally exhibit intense IPD and tan profusely	60-90
VI	Dark brown, black	Insensitive, never burn, tan profusely	100-200

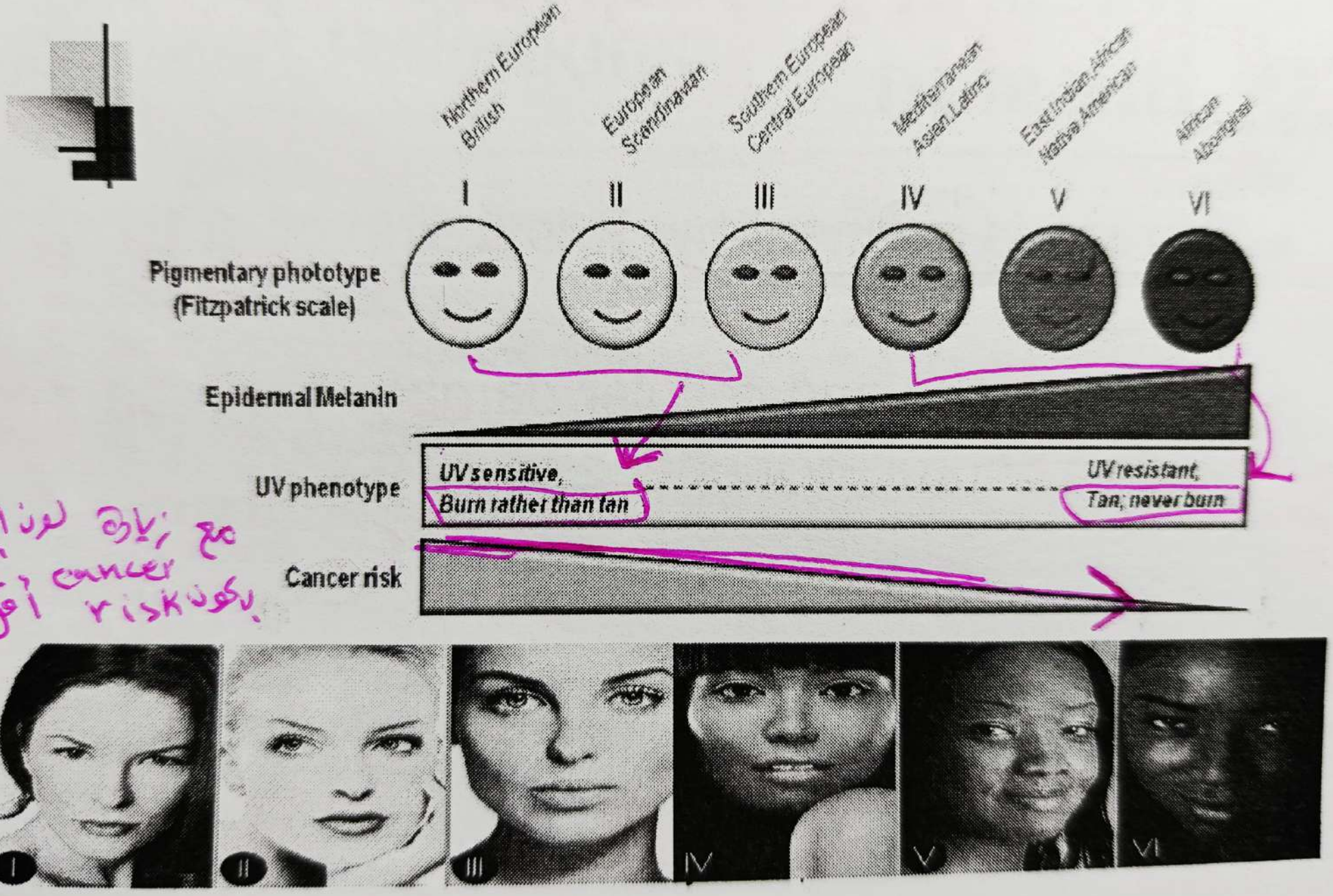
كل ما زاد التانيج ← بتصير البشرة أغمق
← قدرتها على الـ Tanning بتصير أسهل وأسرع
← " " skin burning أقل
← عرضتها للسكانسر بتصير أقل.

تزيد الـ MED مع زيادة لون البشرة.

*based on first 30 to 45 minutes of sun exposure after winter season or without previous sun exposure
IPD: Immediate pigment darkening

Sunscreens

https://en.wikipedia.org/wiki/Fitzpatrick_scale#/media/File:Influence_of_pigmentation_on_skin_cancer_risk.png



مع زيادة لون البشرة
يكون cancer risk أقل .

Sunscreens

- The purpose of a sunscreen is to absorb light in the correct wavelength range to protect the skin. Modern sunscreens protect from both UVB and UVA
- In order to achieve this goal the molecular structure of the sunscreen molecule must allow it to absorb light at the required wavelengths.

وظيفته - حمي البشرة عن طريق امتصاص
الضوء ضمن نظام موجي معين (لازم تكون تركيبته قادرة
تعمل هيك)

UVA + UVB ← in modern SS

Sun protection factor (SPF) value

قدرة واقي الشمس على الحماية وتقليل حصول الـ erythema

- Represents the ability of a sunscreen to delay sun-induced erythema
- The UV energy required to produce an MED on protected skin divided by the UV energy required to produce an MED on unprotected skin

طريقة حساب SPF

$$\frac{MED\ (Protect\ skin)}{MED\ (unprotect\ skin)}$$

- SPF value = MED (protected skin (PS))/MED (unprotected skin (US)), where MED (PS) is the minimal erythema dose for protected skin after application of 2 milligrams per square centimeter of the final formulation of the **sunscreen** product, and MED (US) is the minimal erythema dose for unprotected skin, i.e., skin to which no **sunscreen** product has been applied

sunscreen

كم ملغرام لكل سنتيمتر مربع واقي شمس عشان أحمي protect

Sun Protection Factor (SPF):

- There is a popular misconception that SPF relates to time of solar exposure. For example, many consumers believe that, if they normally get sunburn in one hour, then an SPF 15 sunscreen allows them to stay in the sun 15 hours (i.e., 15 times longer) without getting sunburn
- Rather, SPF is a relative measure of the amount of sunburn protection provided by sunscreens. It allows consumers to compare the level of sunburn protection provided by different sunscreens. For example, consumers know that SPF 30 sunscreens provide more sunburn protection than SPF 8 sunscreens.

Sun Protection Factor (SPF):

- SPF is not directly related to *time* of solar exposure but to *amount* of solar exposure
  - Although solar energy amount is related to solar exposure time, there are other factors that impact the amount of solar energy
  - More UVB reach the earth's at higher altitude than at sea level
  - For example, the intensity of the solar energy impacts the amount. The following exposures may result in the same amount of solar energy:

one hour at 9:00 a.m.
=
15 minutes at 1:00 p.m.

Sun Protection Factor (SPF):

متى بتكون الـ energy intensity؟

- Generally, it takes less time to be exposed to the same amount of solar energy at midday compared to early morning or late evening because the sun is more intense at midday relative to the other times. (1)
- Because clouds absorb solar energy, solar intensity is generally greater on clear days than cloudy days. (2)

كل ما كان الجو صافي وما في غيوم تمتص طاقة ← greater intensity

ممكن أحصل على نفس الطاقة الحرارية في منتصف النهار، مقارنة بالصبح بدري او في العصر لكن في منتصف النهار، بحصلها بوقت أقل

Sun Protection Factor (SPF):

- The internationally agreed upon standard quantity of sunscreen per unit of skin surface required to measure SPF in humans is $2 mg/cm^2$ of skin

كم لازم أحط sunscreen لحتى أقدر أحسب الـ SPF ؟

- For an adult to apply this amount of sunscreen to the entire body, 30 ml of sunscreen is required

لو شخص بالغ قرر يحط واقي شمس على كامل جسمه بناءً على نسبة ٢ ملغ / سم² ← رح يحتاج علبة كاملة لجسمه ٣٠ مل !

Measurement of SPF

- Determine the MED on at least 20 but not more than 25 qualified subjects
- The MED is that amount of UV radiation required to produce the first perceptible redness reaction with clearly defined borders at 22 to 24 hours after irradiation
- To determine the MED, a series of 5 exposures of increasing energy is administered to the subject's unprotected skin
- Each exposure is 25% greater than the previous exposure
- At 22 to 24 hours after exposure, a trained grader other than the person who conducted the irradiation or who applied the sunscreen evaluates the redness of each exposure site
- The MED on unprotected skin is used to calculate the radiation exposure for the sunscreen-protected site

① بنجيب ٢٠ - ٢٥ شخص وبنعرضهم لـ UV
② بنعرضهم على مراحل، وبكل مرة بزيد الـ UV ٢٥٪ أكثر من الكمية السابقة
③ بعد ٢٢ - ٢٤ ساعة بنقيّم شدة حمرة الـ erythema للجلد، الأشخاص إلي جلدهم unprotected.

① نحط عالبشرة من ال sunscreen طبقة وبتركها تنشف.
② بنزل البشرة على المي بدرجة حرارة ٢٣ - ٣٢ °C مدة ٢٠ دقيقة.
③ بطلع وزن من المي فترة راحة مدة ٢٠ دقيقة وبعض أكرر العملية

Measurement of SPF

كيف بتأكد إنه الواقي شمس عندي ضد المي؟

- To determine the water resistance of a sunscreen formulation you must first subject the skin with sunscreen test material to repeated exposures to fresh water maintained at 23 to 32 C.
- The sunscreen is applied to the skin and allowed to dry
- The subject enters the water and engages in moderate activity for 20 minutes, the subject exits the water to rest for 20 min, being careful to avoid rubbing off the sunscreen

ما نفرك واقي الشمس طول هاي العملية

Measurement of SPF

- For a water-resistant claim, the 20 minutes in the fresh water is repeated once more (total 40 minutes in water)
- For a very water resistant claim the 20 minutes in fresh water is repeated three more times (total of 80 minutes in water)

مرة واحدة إضافية
٢٠ دقيقة جوا الميه + ٢٠ دقيقة برا

X 3

Total 40 min ← In water ٢٠ دقيقة ← المرة الأصلية (1)
← كمان مرة + المرة الأصلية ← water resistant (2)
Total 80 min. ← ٣ مرات + " " ← very " " (3)

- For the water-resistant sunscreen: خصائص

1. The lipophilic base allows the products to adhere well to the skin
2. Greasy feel
3. The higher SPF formulations tend to be oilier or more opaque

- " waterproof": Not allowed in the labeling

ممنوعة !

! Proof مش water resistant فقط مسموح تكتبي

Sun Protection Factor (SPF):

لما بقيس الـ SPF بعتمد عاUVB > UVA

- Points to note:
  - It is a system based mainly on ultraviolet B exposure
  - UVA exposure and dose are not accounted for in the current methods of measuring SPF
  - Most people do not apply the sunscreen as thickly as it is applied in the testing

لهيك ممكن في ناس ما تكون حاطة كمية صح من الواقي شمس

الدراسة بتوضح إنه الناس بس بتحصّل على ٢٠ـ ٥٠٪ من ال SPF
بسبب انهم ما بستخدموه مع (Thickly)

- A study demonstrated that most users probably achieve a mean SPF of between 20 and 50% of that expected from the product label because they do not apply the sunscreen as thickly as is done in laboratory conditions

(Stokes & Diffey: How well are sunscreen users protected? Photodermatol Photoimmunol Photomed, 13: 186, 1997)

يعني الحماية من أشعة الشمس عادةً تكون $\frac{1}{3}$ قيمة الـ SPF

$5 = \frac{1}{3} \times 15 \Leftarrow 15 = SPF$ كما أوضحنا سابقاً

يعني هي قادرة تحمي الجلد أكثر بـ خمس أضعاف الـ unprotect skin

- A useful-rule-of-thumb is that the protection most people get from a sunscreen is equal to about one-third of the SPF
- SPF 15 sunscreen at a typical application thickness to the face provide about fivefold protection $15 \times \frac{1}{3} = 5$

Sunscreen Ingredients Classification:

1.Physical sunscreen ingredients (more correctly known as **inorganic** (mineral) sunscreen ingredients): zinc oxide and titanium dioxide.

2. Chemical sunscreen ingredients (more correctly known as **organic** sunscreen ingredients).

Sunscreen Ingredients Classification:

- At present, all organic UV absorbers used in sunscreens possess aromatic moieties.
- The substitutions at the aromatic ring are of great importance for the UV spectroscopic properties. An increase in the number of resonance structures stabilizes the excited state

Sunscreen Ingredients

Sunscreen Ingredients Classification:

- You can have sunscreens containing only organic filters, only inorganic filters, or a combination of both.

Sunscreen Ingredients Classification:

- The basic requirements for all UV filters that are used in sunscreens are:

1) efficacy,
2) safety
3) registration, and
4) freedom-to-operate with respect to the status of intellectual property

Sunscreen Ingredients Classification:

سواء كان chemical أو Physical

- Both ingredients absorb UV at certain wavelength range
- Inorganic sunscreens also scatter and reflect about 5-10% of the incoming UV, نسبة قليلة
- Some particulate organic sunscreens like Tinosorb M also scatter and reflect UV light
- better to be classified as both chemical (1) and physical. (2)
-

Physical

chemical

زمان كانوا يسمّوهم Physical بناءً على أنه بيعملوا reflection + scattering للضوء

Sunscreen Classification:

A. Physical sunscreens

لهي حالتُ هادي التسمية خطأ وكانم لحكي عنهم Mineral (inorganic) sun screen.

- For these UV filters, the term 'physical UV filters' was initially used, attributed to their first known mechanism of sun blocking through the physical manner of reflection and scattering. However, small inorganic UV filter particles also absorb part of the incident light . لهاد سبب التسمية الصح

هاد زمان

- Are rarely associated with allergic reactions. They remain on the skin's surface and are not systemically absorbed
- People with sensitive skin are more likely to tolerate this type of sunscreen than the chemical type

مناسب للبشرة الحساسة

- Are recommended when intense sun exposure is expected

هاد النوع من واقيات الشمس جيد على سطح الجلد وما بغيره ..

امتصاص ← لهيك ما بتعمل تحسس

مناسب للبشرة الحساسة + ما بيكون في تركيز مكثف للشمس

Sunscreen Classification: A. Physical sunscreens

- Titanium dioxide (TiO_2)
- Zinc oxide (ZnO)

أمثلة

  - Cosmetically acceptable translucent or colloidal suspension that consist of micronized preparations of ZnO and TiO_2 have been developed

لقد تم تحضير ZnO + TiO_2 بتقنية micronized preparation حتى يعطوا اللون الشفاف.

Sunscreen Classification:

A. Physical sunscreens

ميزات الـ Physical من واقيات الشمس

- Titanium dioxide and zinc oxide impart high ① SPF values, provide broad spectrum ② (UVA, UV B) protection, and relatively inexpensive ③
- The difficulty in formulating with them is creating a product with acceptable consumer qualities

المشكلة

لها على الرغم من هاي الميزات
لكن في صعوبة بتحضيرهم بأنهم يكونوا مناسبين
للمرضى من ناحية مثلاً اللون، الشفافية وغيرها.

Sunscreen Classification:
A. Physical sunscreens (Metal oxides)

(as $TiO_2 + ZnO$) ← OFR

- Metal oxides may produce oxygen free radicals at their surface when irradiated
- However to affect skin, the particles would have to traverse the SC
- They are too large to enter the skin
- Most companies minimize the photoreactivity of these agents by coating the surface with dimethicone or silicone (1)
- They're processed to get rid of toxic contaminants, (2) and often need to be coated in synthetic chemicals (3) to stop them from being photocatalytic, and prevent them from clumping up and causing patchy protection → that's why the natural claim is questionable.

الهدف من هاذي التعديلات هو تقليل الضرر + نقلل تكتلاتة بالبشرة
فيصير مقبول أكثر ← بسبب التعديلات هاذي بطل طبيعي Natural