THE LIGHT WE CAN SEE – SOLAR RADIATION AND THE SKIN

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SWART
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Promex

SOLAR UV RADIATION

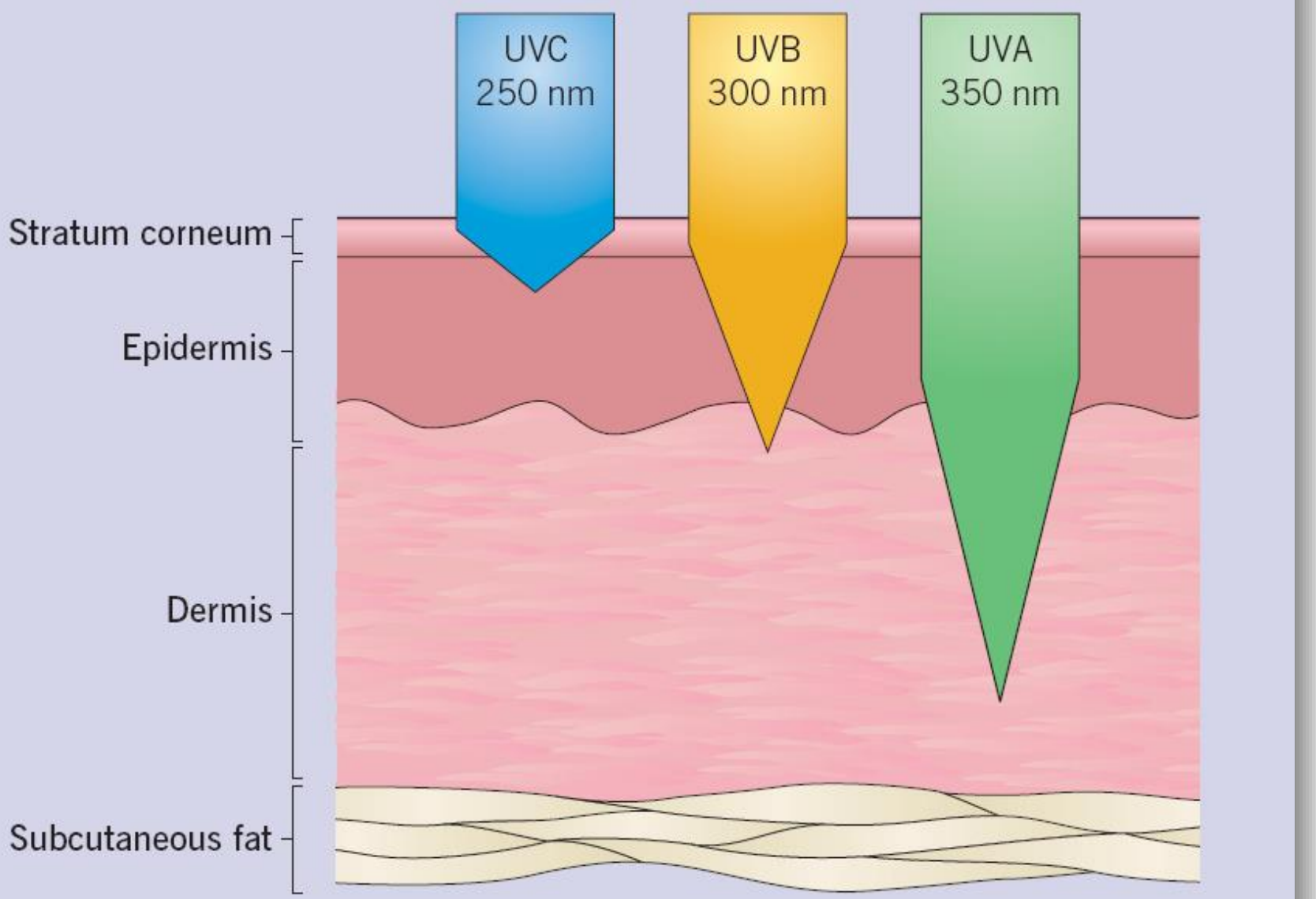
‘Sunlight’ is a portion of the electromagnetic radiation given off by the sun and is divided into three parts (UVA, UVB, UVC) based on its biological effects.

Only UVA and UVB reach the Earth’s surface since stratospheric ozone absorbs all UVC.

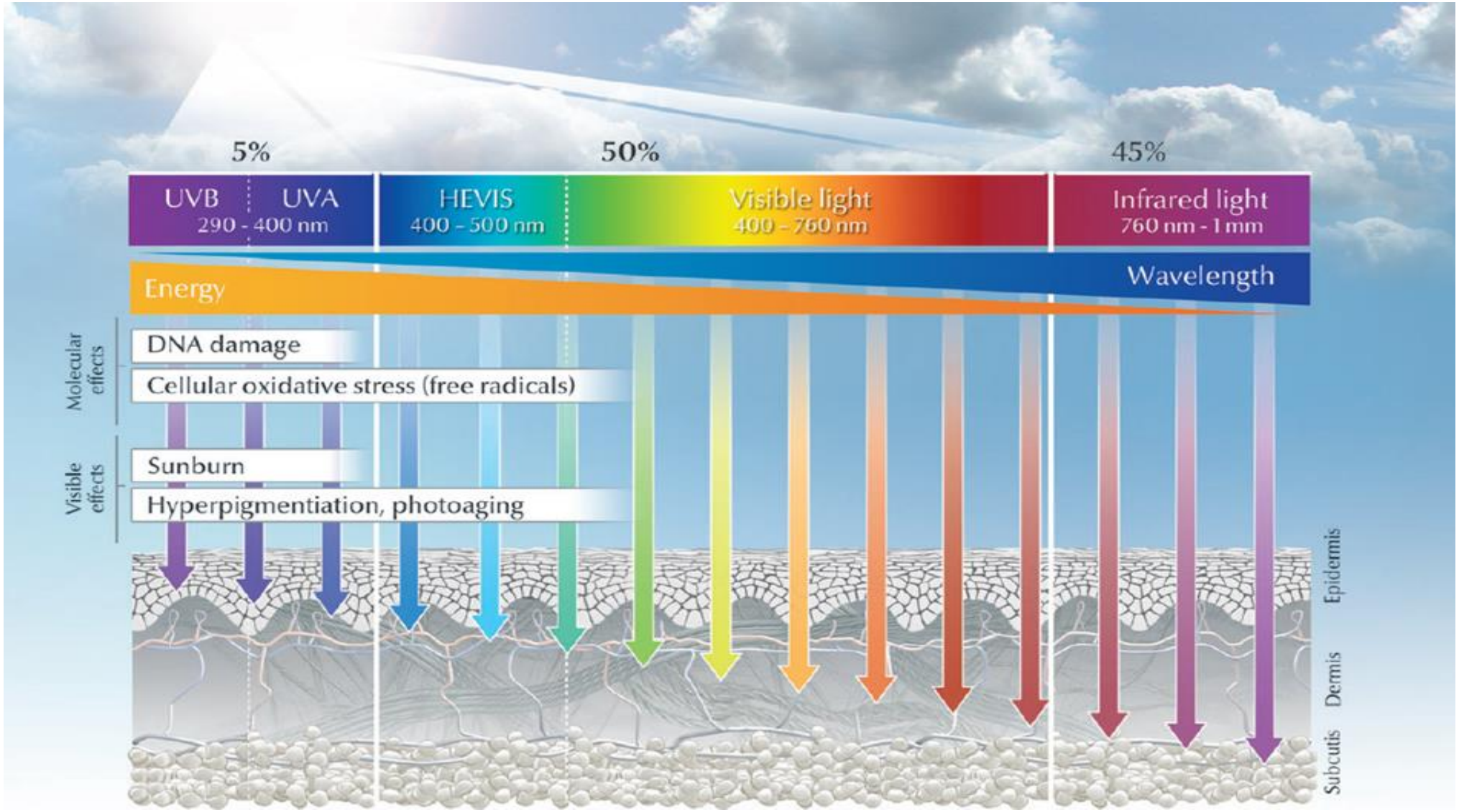
Other parts of the solar electromagnetic spectrum including high energy visible light (VL)

Infrared light (heat) is postulated to have a role in photoaging and rosacea

PENETRATION OF DIFFERENT UV WAVELENGTHS



Different light types exposed by the sun



UVC (100-290 nm) is highest energy (most hazardous), absorbed by the atmosphere, stopped by ozone

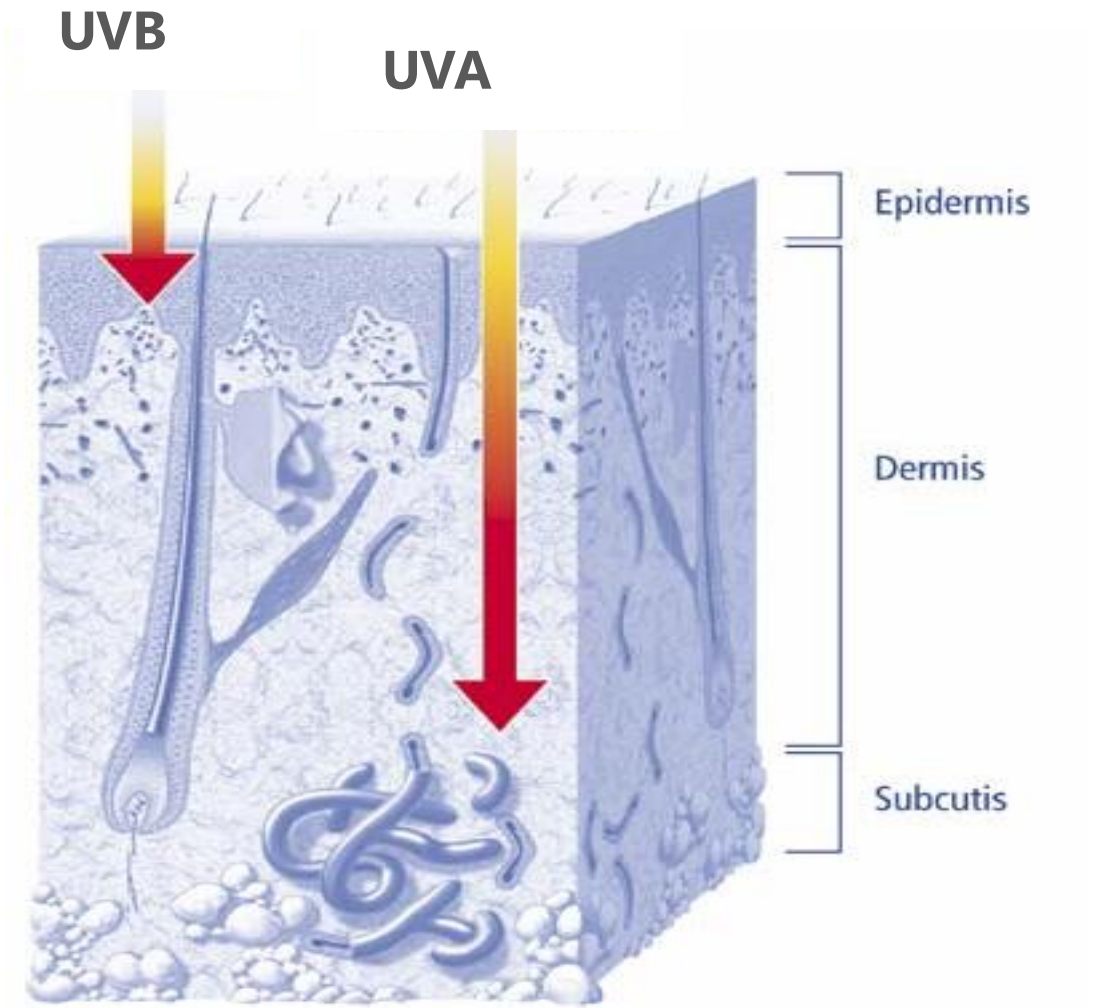
UVB + UVA + HEVIS + IR have different effects due to different energy + different sites of action in the skin (penetration)

THE SUN AND THE SKIN

- Skin is exposed to solar radiation, thus oxidative stress every day
- Moderate dose of solar radiation is indispensable for our health
- UVB stimulates the vitamin D synthesis in skin, essential for bone, nerve & muscle growth
- Solar radiation positively influences circulatory system & psychological well-being
- Excessive exposure to solar radiation, however, these positive effects turn detrimental
- Repeated exposure to excessive doses of radiation can lead to
  - Photoaging
  - Immunosuppression
  - Development of skin cancer
- Key cause is formation of free radicals in skin -measure for oxidative stress

1. Effects on detection of radical formation in skin due to solar irradiation measured by EPR spectroscopy, Stephanie Albrecht et al, Methods Volume 109, 2016, P 44-54 https://www.sciencedirect.com/science/article/abs/pii/S1046202316301608

UVA & UVB ACT DIFFERENTLY

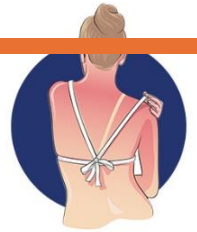


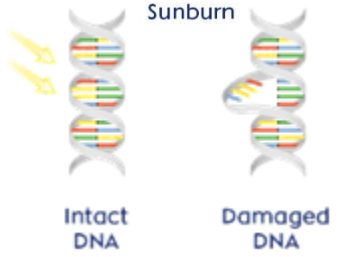
- UVB transmits high levels of energy into the epidermis
- UVA penetrates deep into the dermis

BE AWARE

- Both induce skin cancer

UVB

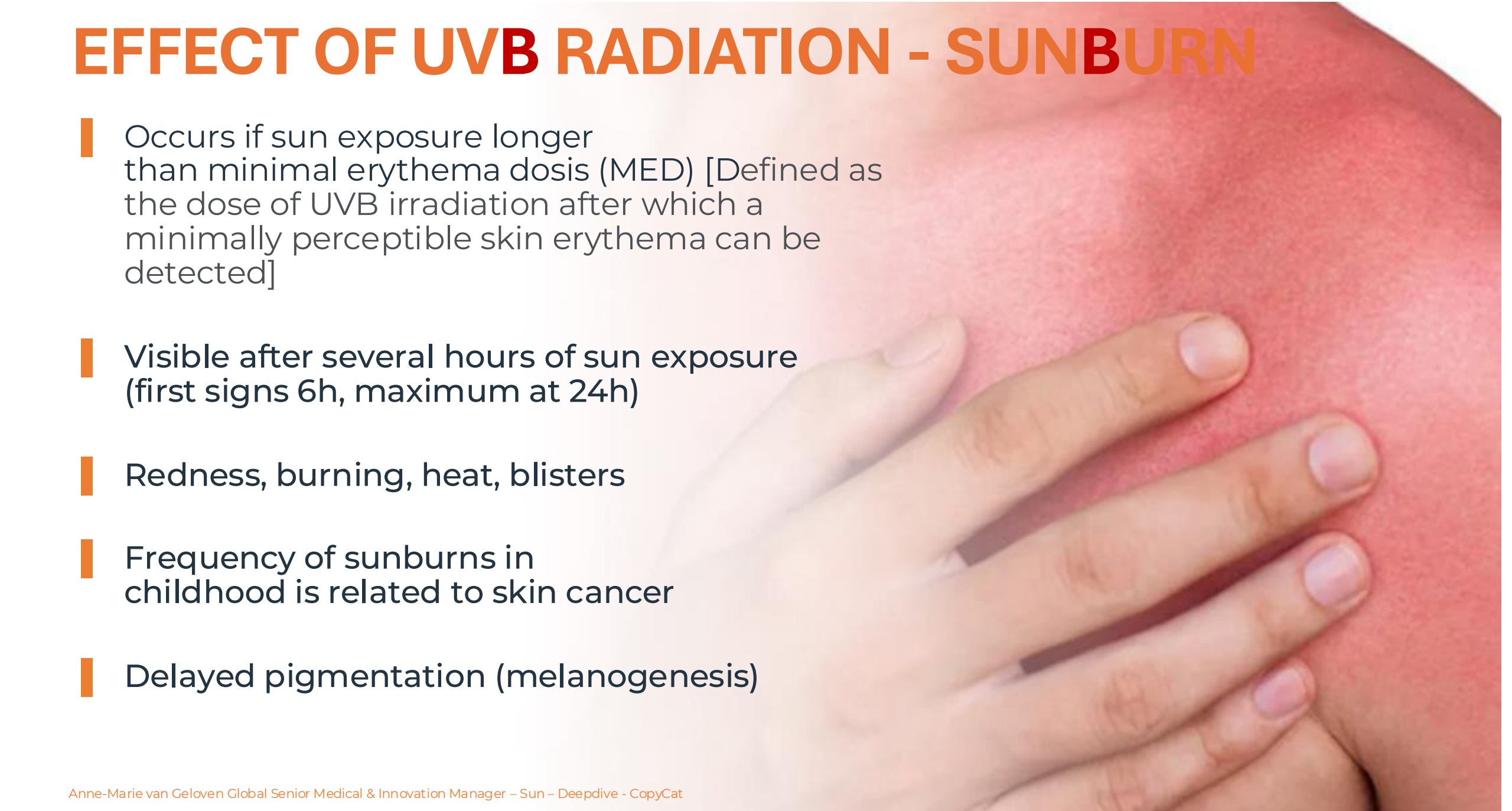




UVA

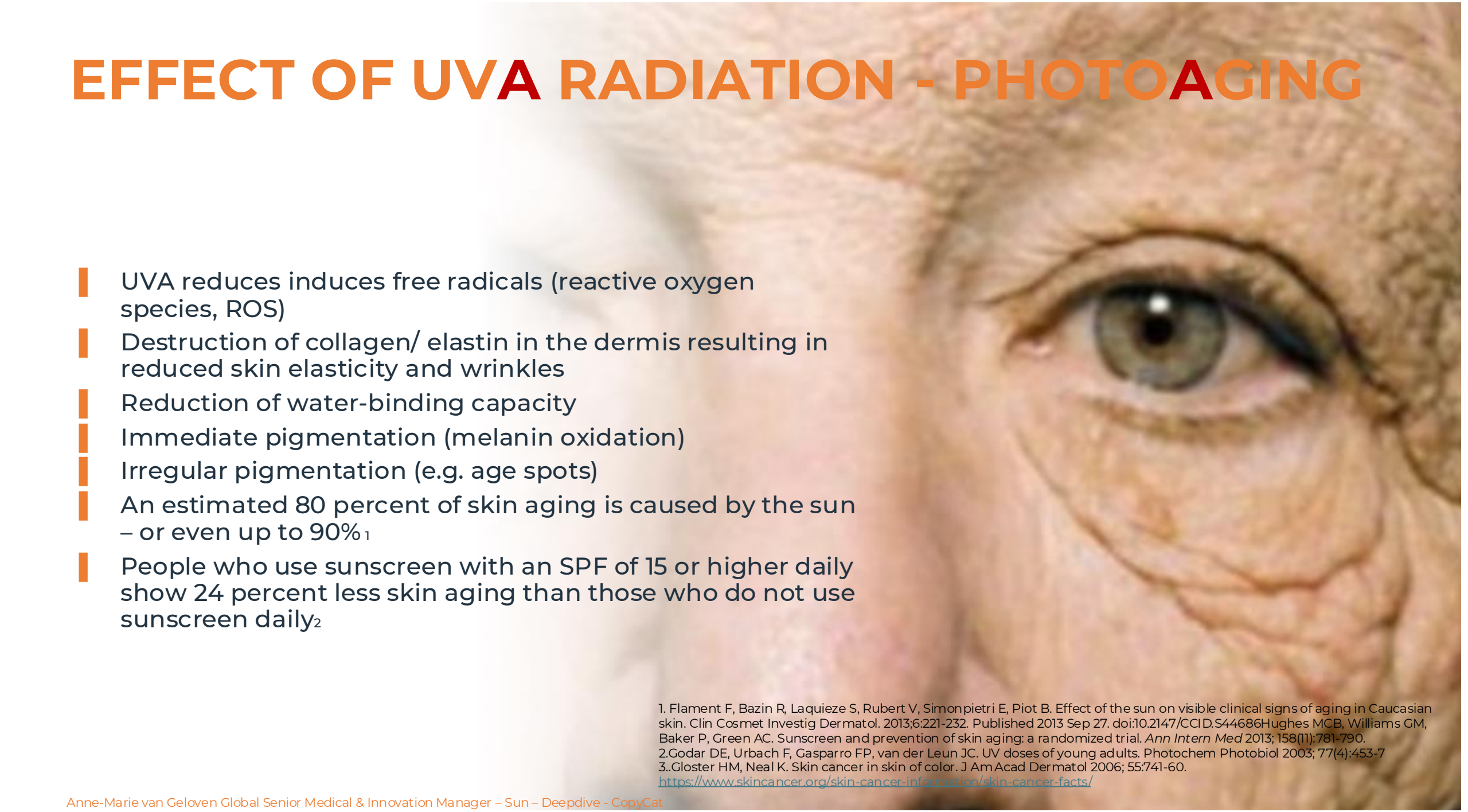
EFFECT OF UVB RADIATION - SUNBURN

- Occurs if sun exposure longer than minimal erythema dosis (MED) [Defined as the dose of UVB irradiation after which a minimally perceptible skin erythema can be detected]
- Visible after several hours of sun exposure (first signs 6h, maximum at 24h)
- Redness, burning, heat, blisters
- Frequency of sunburns in childhood is related to skin cancer
- Delayed pigmentation (melanogenesis)



EFFECT OF UVA RADIATION - PHOTOAGING

- UVA reduces induces free radicals (reactive oxygen species, ROS)
- Destruction of collagen/ elastin in the dermis resulting in reduced skin elasticity and wrinkles
- Reduction of water-binding capacity
- Immediate pigmentation (melanin oxidation)
- Irregular pigmentation (e.g. age spots)
- An estimated 80 percent of skin aging is caused by the sun – or even up to 90%[1]
- People who use sunscreen with an SPF of 15 or higher daily show 24 percent less skin aging than those who do not use sunscreen daily[2]



1. Flament F, Bazin R, Laquieze S, Rubert V, Simonpietri E, Piot B. Effect of the sun on visible clinical signs of aging in Caucasian skin. Clin Cosmet Investig Dermatol. 2013;6:221-232. Published 2013 Sep 27. doi:10.2147/CCID.S44686Hughes MCB, Williams GM, Baker P, Green AC. Sunscreen and prevention of skin aging: a randomized trial. *Ann Intern Med* 2013; 158(11):781-790.
2.Godar DE, Urbach F, Gasparro FP, van der Leun JC. UV doses of young adults. Photochem Photobiol 2003; 77(4):453-7
3..Gloster HM, Neal K. Skin cancer in skin of color. J Am Acad Dermatol 2006; 55:741-60.
https://www.skincancer.org/skin-cancer-information/skin-cancer-facts/

Eucerin®

SOLAR
SPECTRUM

BLUE LIGHT

THE HIGH ENERGETIC PART
OF VISIBLE LIGHT

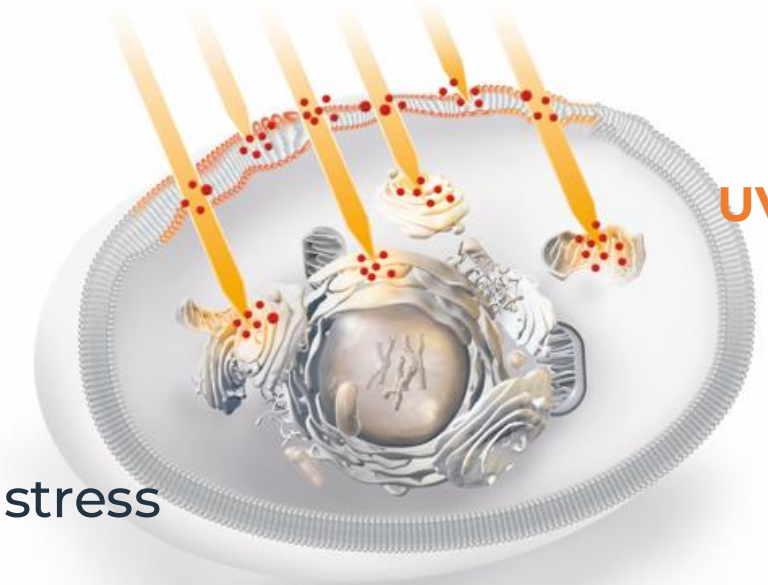
BLUE LIGHT CAUSES OXIDATIVE STRESS AND CAN LEAD TO **PHOTOAGING** AND **HYPERPIGMENTATION**

Photoaging
Mainly lighter skin types (I-III)

Hyperpigmentation
Mainly darker skin types (IV-VI)

PHOTOAGING

PHOTOAGING

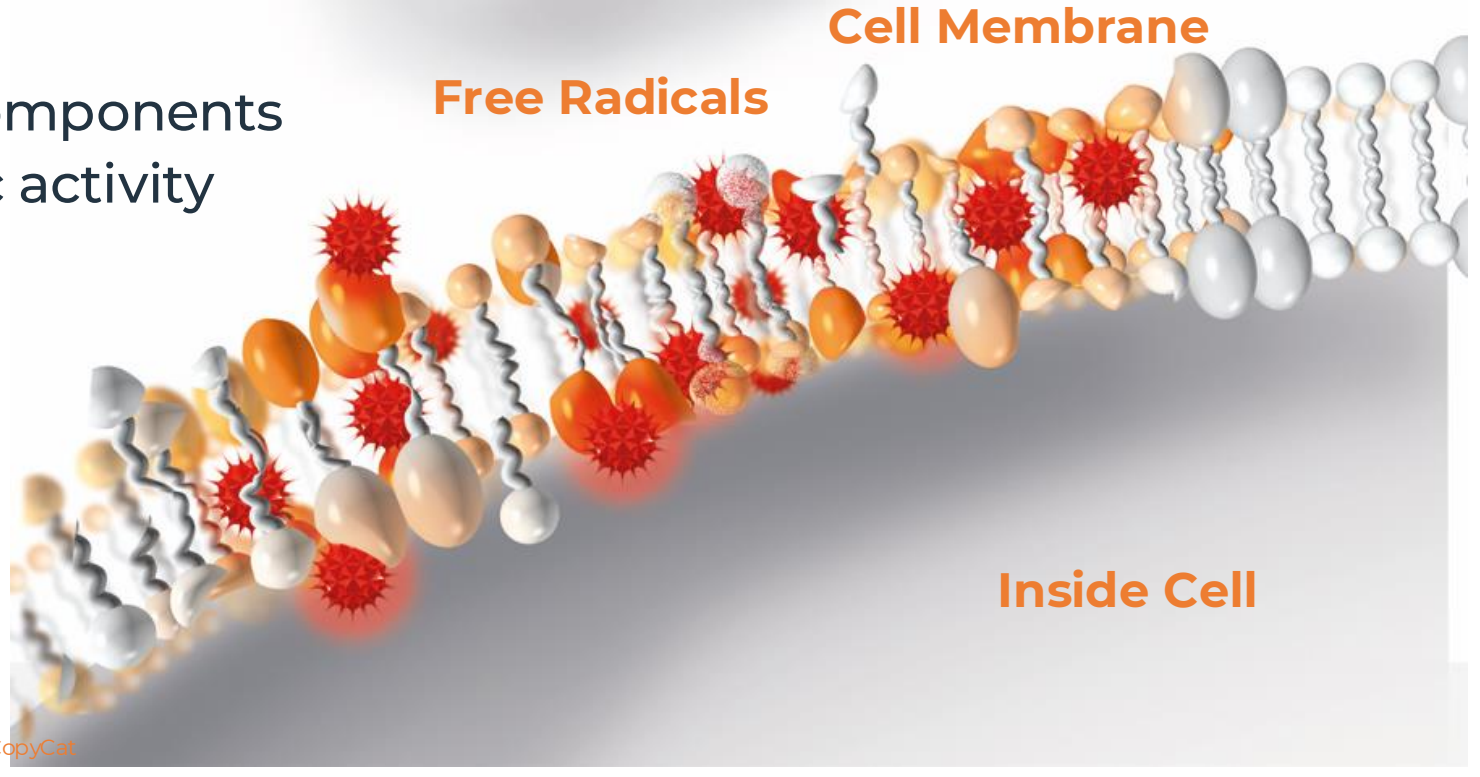


CELL STRUCTURAL DAMAGE

- UV + Blue light induce cellular oxidative stress

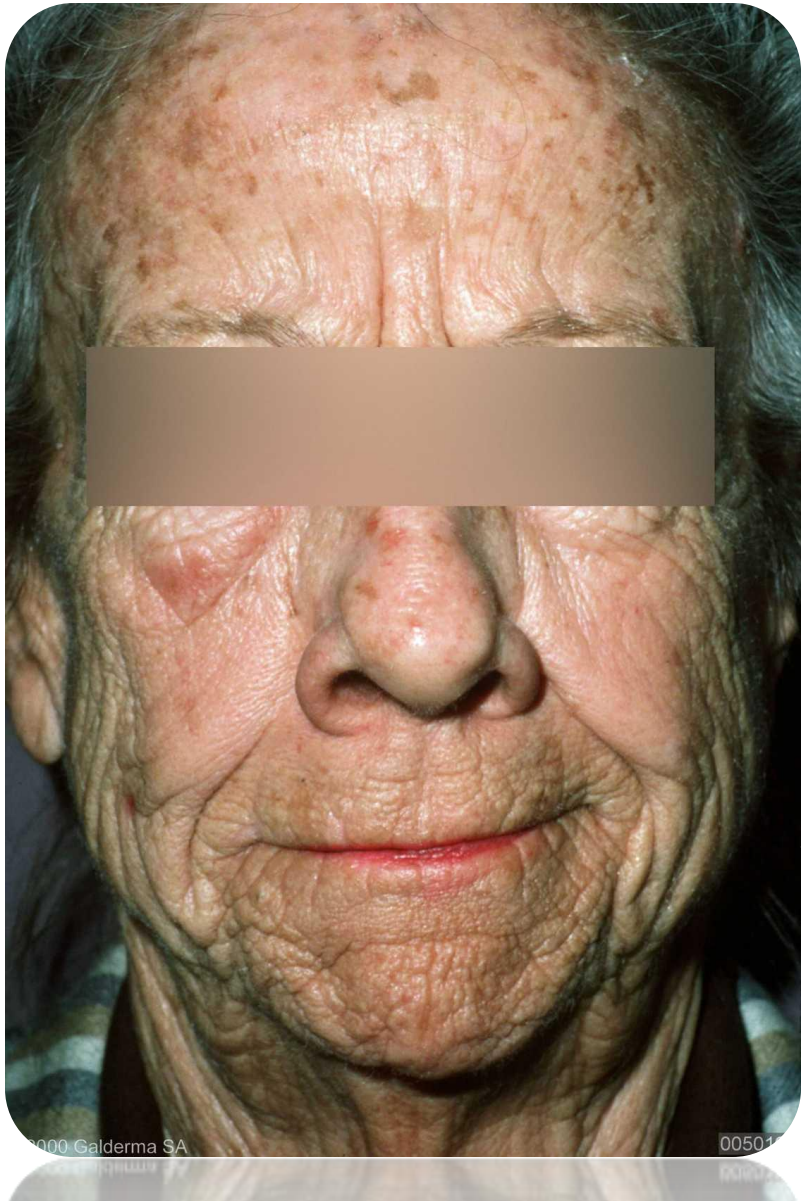
FREE RADICALS:

- promote degradation of ECM components
- increase degradation enzymatic activity
- impair cell membrane function
- damage DNA + proteins + lipids

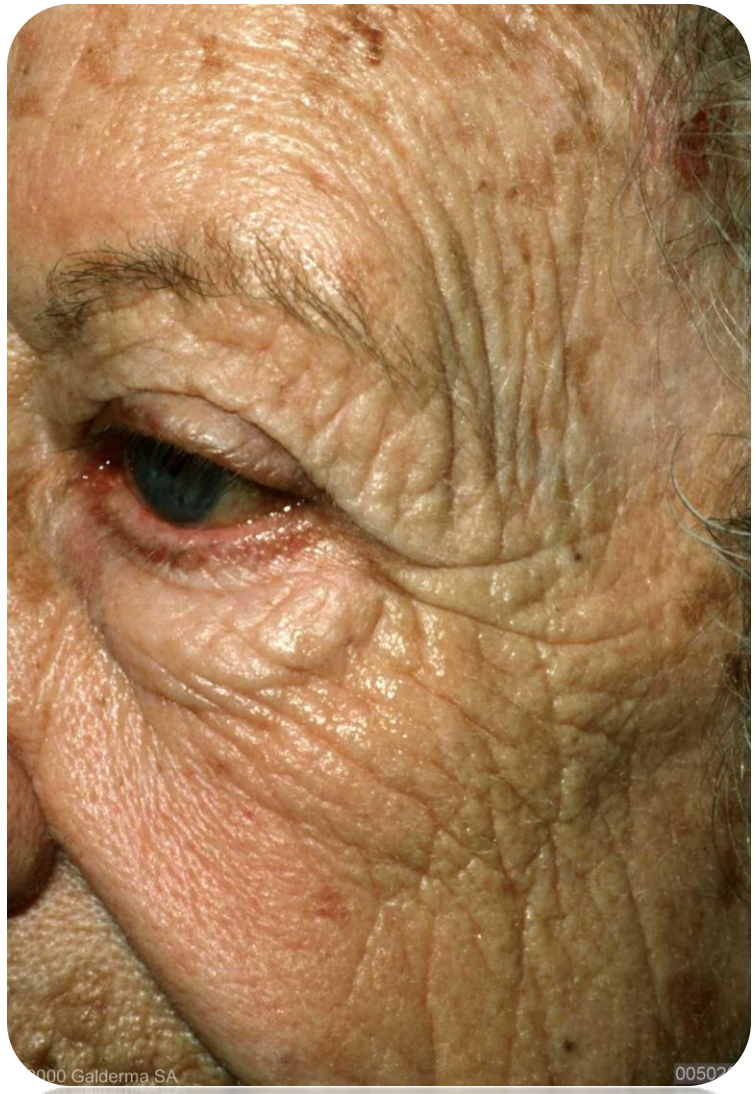


SOLAR ELASTOSIS

WRINKLES



WRINKLES



PIGMENTATION

TELANGIECTASIA

POIKILODERMA OF CIVATTE

SENILE ECCHYMOSIS

STELLATE PSEUDO SCARS

COMEDONES

CARCINOGENESIS

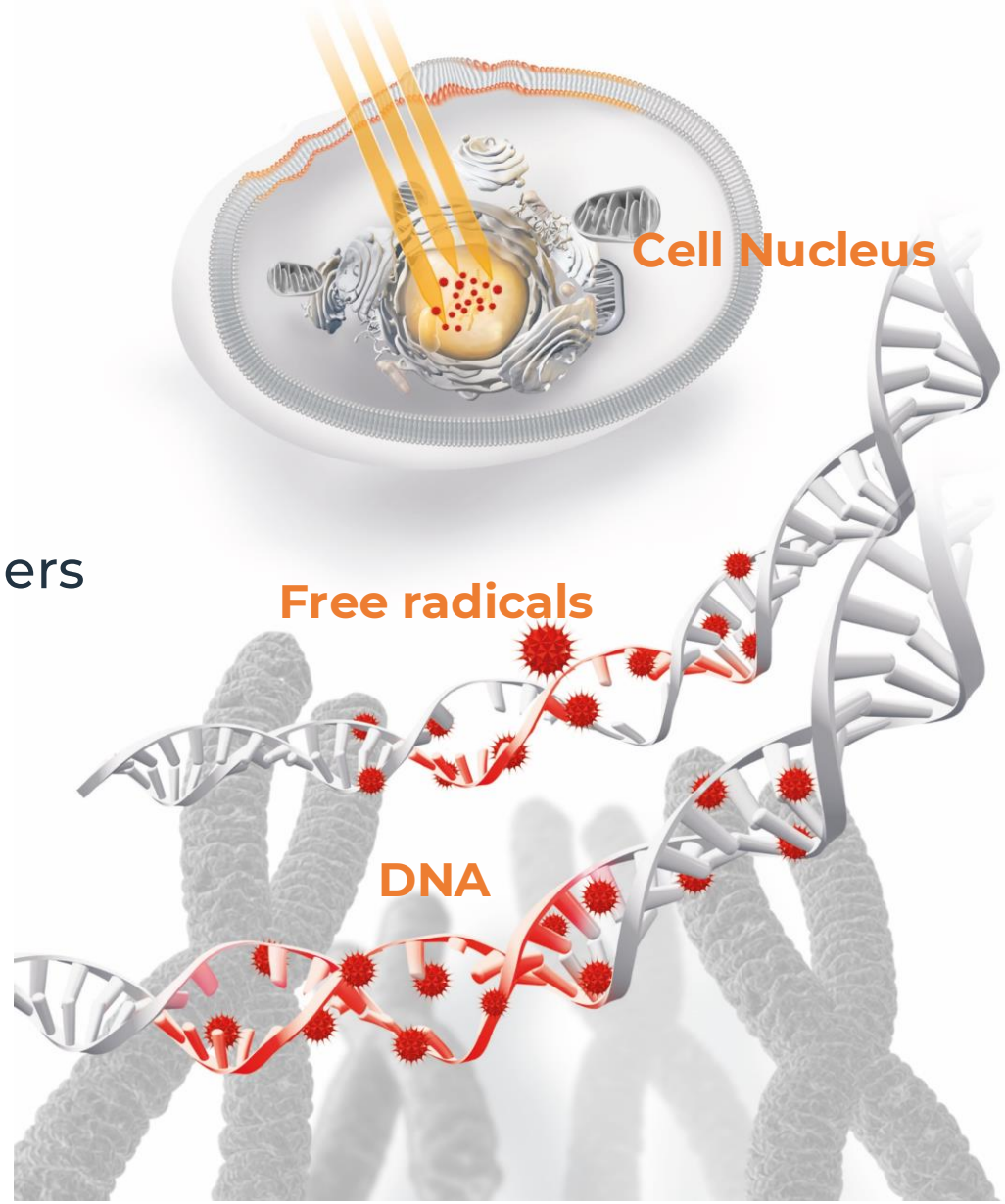
DNA DAMAGE

DIRECT DNA DAMAGE

- UV light is directly absorbed by DNA
- Formation of Cyclobutane Pyrimidine Dimers (CPDs)

INDIRECT DNA DAMAGE

- Sunlight induces free radicals
- DNA damage through free radicals



PHOTOCARCINOGENESIS

UV exposure

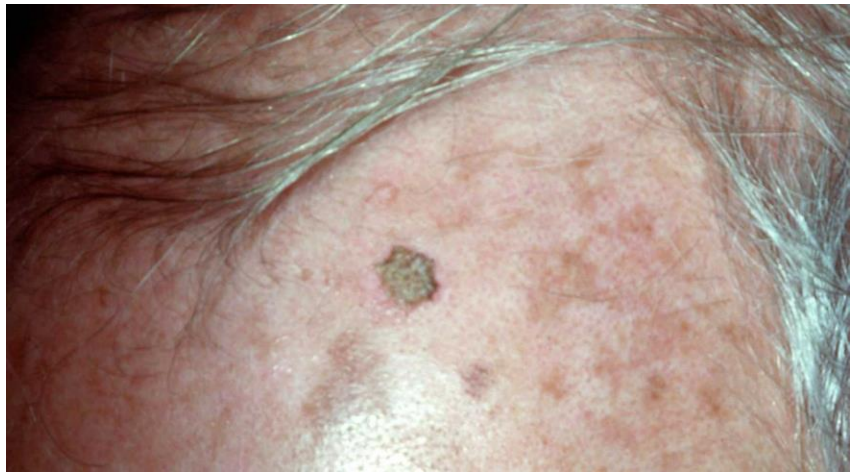
DNA damage

Formation of mutations – p53

Malignant transformation

SKIN MALIGNANCIES

Actinic keratosis

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BASAL CELL CARCINOMA


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SQUAMOUS CELL CARCINOMA


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MELANOMA

AT RISK POPULATIONS

- children and adolescents with light skin
- people with a high number of nevi
- people with a family history of melanoma
- people on photosensitizing medication
- Immunosuppressed patients (e.g., transplant patients)
- people with oculocutaneous albinism (OCA)/ other genetic disorders

WHAT HAVE WE LEARNT

- Exposure to solar UVR is an important modifiable risk factor to prevent the adverse effects associated with excess solar UVR exposure.
- By reducing exposure to solar UVR, one can prevent sunburn and other adverse consequences from solar UVR exposure.
- Personal sun protection (also known as photoprotection) is the most effective mechanism for reducing solar UVR exposure and includes the use of sunscreen as well as sun avoidance methods

International Journal of Dermatology

Review

Integrated sun protection advice for the South African population

Bianca Tod, MBBCh, FCDerm, MMed (Derm)[1] Dagmar Whitaker, SEG, MD, MMed (Derm)[2]
Willie Visser, MBChB, MFamMed, MMed (Derm)[1]
Thuraya Isaacs, MBChB, MFamMed, FCDerm, MMed[3]
Tarryn Jacobs, MBChB, FCDerm, MMed (Derm)[4] Kim Wiid, PhD[5]
Ncoza C. Dlova, MBChB, FC Derm, PhD[6] and Caradee Y. Wright, MSocSc, PhD[7,8]

SUN AVOIDANCE METHODS

A combination of sun avoidance methods is recommended.

Sun protective clothing

- Wear clothing with a clear ultraviolet protection factor (UPF)
- Otherwise, select tightly woven fabrics in darker brightly dyed colors
- High collars, long sleeves, and long pants are preferred

Broad-brimmed hats

- Wear a hat with a brim that extends around the entire circumference of the head, with a brim of at least 6–7.5 cm

Sunglasses

- UV-rated, good quality, large, wraparound sunglasses are ideal

Seeking shade

- Trees, physical awnings/shade sails, and so forth should be deliberately planned and sought out

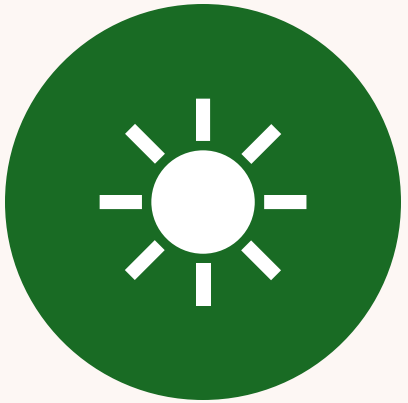
Avoiding peak solar UVR hours

- Plan to avoid sun exposure between 1000 and 1600 hours.
  Sun exposure before or after these times still requires sun protection.

Shadow rule: if one's shadow is shorter than one is tall, there are high levels of UVR, and it is important to avoid the sun or limit sun exposure.

SUNSCREENS

CREAMS AND LOTIONS



ABSORB OR REFLECT SOLAR RADIATION (ORGANIC AND INORGANIC)

UVA, UVB, VISIBLE LIGHT BLOCKERS

UVB PROTECTION

- SPF = Sun Protection Factor [Number assigned to a sunscreen that is the factor by which the time required for unprotected skin to become sunburned is increased when the sunscreen is used].
- Only for UVB
- “UVB sunburn protection factor”
- Low (<15), medium (<30), high (<50), highest (50+)
- Does not say anything about UVA!!!!!

UVA PROTECTION

- No consensus in the world
- SA guidelines - UVA protection should be a minimum of 1/3 of SPF
- Some individuals (i.e., people with darker skin colors and hyperpigmentation disorders) will benefit from higher levels of UVA

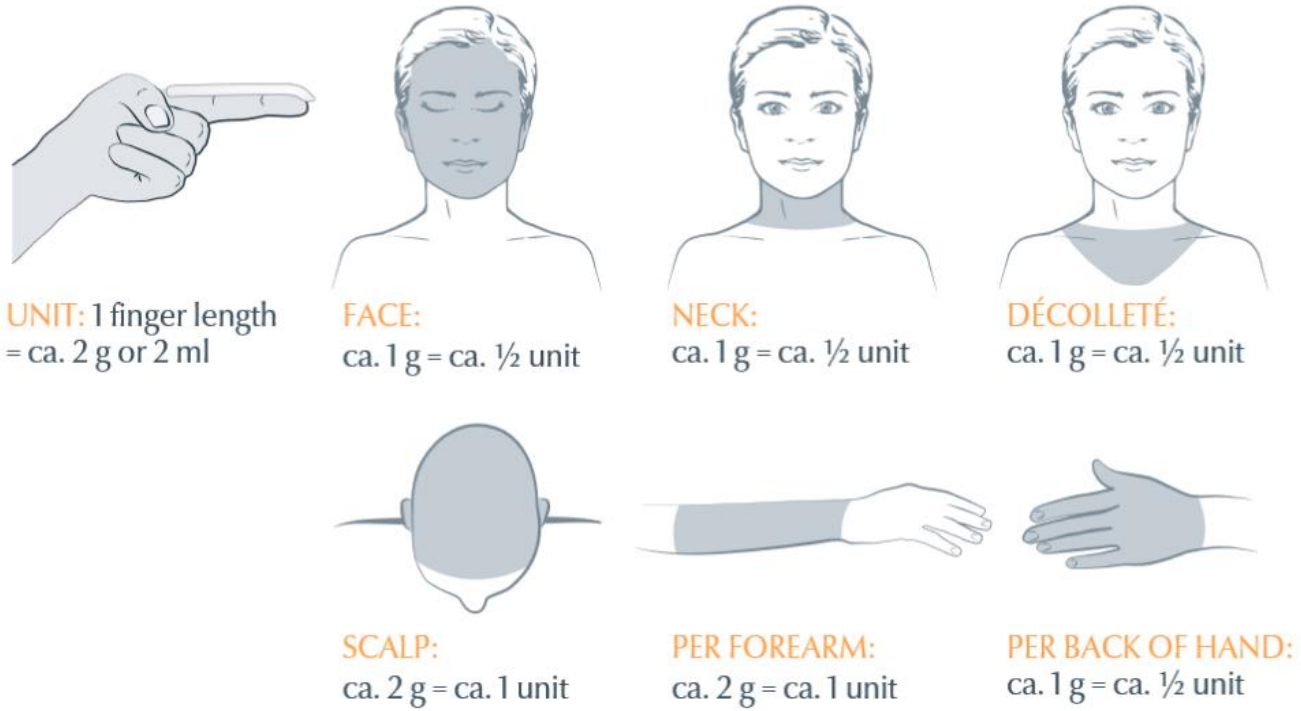
VISIBLE LIGHT

- Visible light protection is a relatively new concept in sun protection.
- VL includes high energy blue or violet light - this is the portion of the visible spectrum that appears to have the most relevant biological effects
- To protect the skin from VL, sunscreen needs to be visible on the skin
- Inorganic sunscreens partially protect from VL but are not cosmetically acceptable, particularly on dark skin colors.
- At present, tinted sunscreens containing iron oxides and pigmentary titanium dioxide appear to be the best option for VL protection.
- Of particular importance in patients with pigmentation disorders, photosensitivity from HIV, photoageing

SUNSCREEN APPLICATION

- Daily application of sunscreen is recommended to individuals of all skin colours, especially for individuals with light skin
- Sunscreen must be applied in adequate amounts-use the 2-finger method as a guideline
- Sunscreen should be applied to all exposed areas of skin (including bald areas of the scalp, ears, and tops of hands)
- Sunscreen should be applied 15–30 minutes before sun exposure and re-applied after perspiring or swimming, or every 2 hours

EUCERIN APPLICATION



Apply every morning on in sufficient quantities (2 mg/cm2). In case of direct sun exposure reapply every
2 hours, especially after swimming, perspiring or toweling to maintain the original protection. Reducing the quantity will lower the level of protection significantly. Daily and regular use throughout the year is necessary for optimal protection.

DAILY AND REGULAR USE
THROUGHOUT THE YEAR IS NECESSARY FOR OPTIMAL PREVENTION

IDEAL SUNSCREEN

- Cosmetically acceptable
- Not too expensive
- UVA + UVB
- SPF > 30 (preferably >50)
- Look at the active ingredients
- Reputable manufacturer
- Not as part of make-up

- **NEVER AS ONLY PROTECTION!!!!!!**

The solar spectrum & sun protection

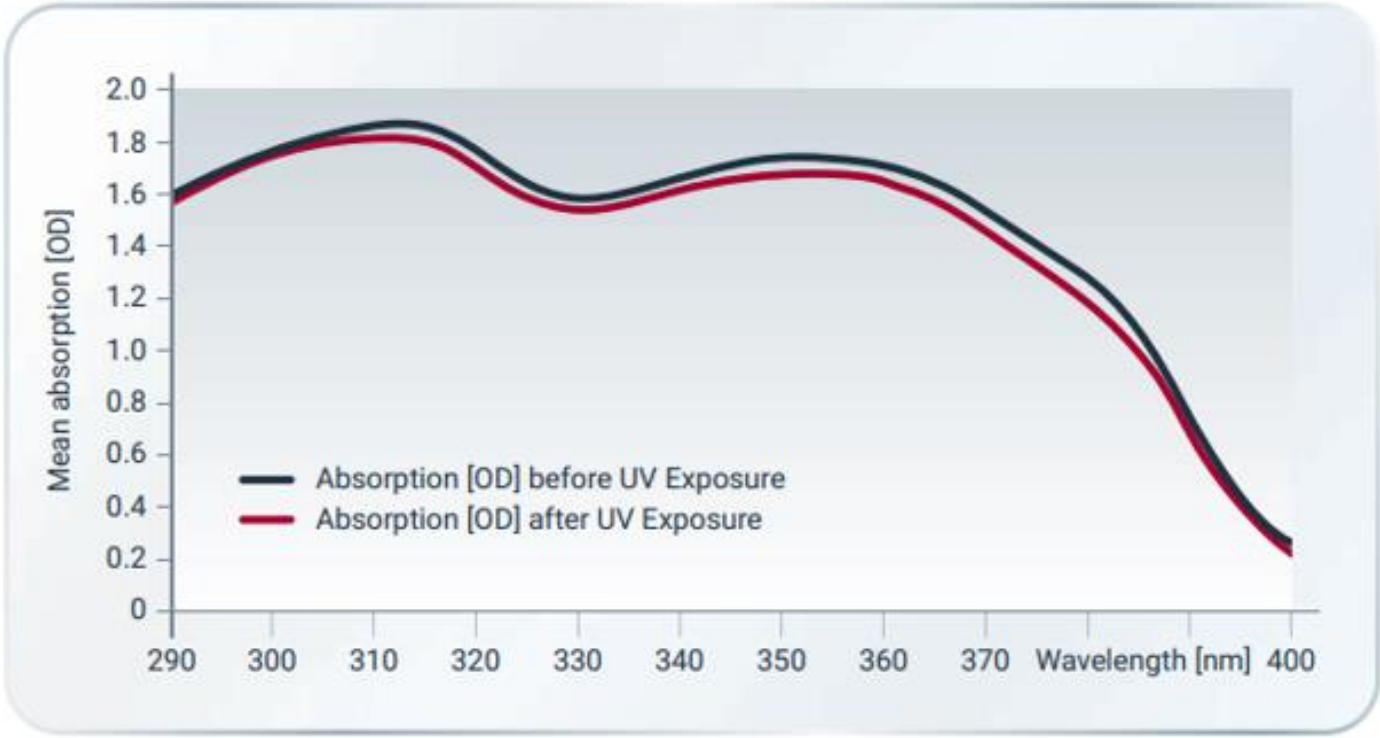
B BURN

A AGEING

H HYPERPIGMENTATION &

P HOTOAGEING

Hydro protect 50+ | ultralight sunprotection with very high UVB and UVA protection



Highest protection over the complete UV spectrum

Actinic Control MD SPF 100
Prevention of Actinic Keratosis & Non-Melanoma Skin cancer

OUR FIRST MEDICAL DEVICE

Primary intended purpose to prevent AK & NMSC

SUPERIOR PROTECTION

Potent combination of UVB, UVA and broadband filters. Highest protection in assortment and superior to competition

BEYOND PROTECTION

Water resistant, sweat resistant, fragrance free, suitable for sun sensitive skin

BEST IN CLASS TEXTURE & SENSORY

84% CONFIRM LIGHT & PLEASANT TEXTURE *

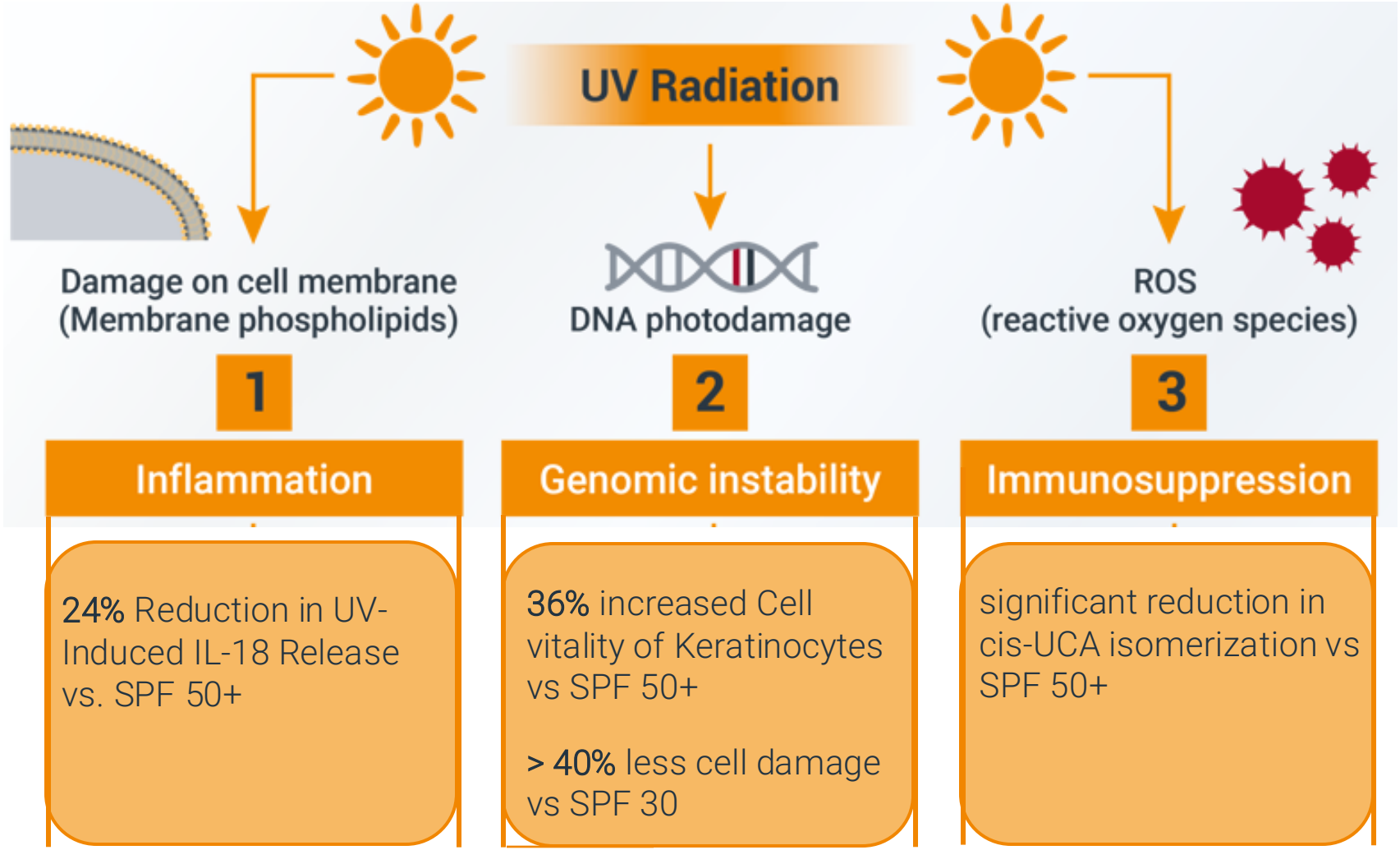
RELEVANT INDICATION

Prevents against sun-induced skin damage, actinic keratosis and other forms of non-melanoma skin cancer

*Assessment of 4-week local tolerability of Eucerin® Actinic Control MD SPF 100 in 45 subjects previously treated for actinic keratosis, in a multi-center, open-label clinical investigation. (BDF data on file)

Summary

With an SPF 100:



SUN PROTECTION IN SKIN OF COLOUR

- Sun protection advice can be given for three different skin colours: dark, medium, and light
- should primarily be based upon an individual's response or reaction to sun exposure.
- there is little to no evidence about efficacious sun protection that protecting against skin cancer, for individuals with dark and medium skin colour
- the value of sun protection for skin cancer prevention has an inverse relationship with the degree of melanin pigmentation in the skin, that is, sun protection is important for people with light skin and less melanin compared to the value of sun protection for people with dark skin
- despite the high protection to epidermal DNA afforded by dark skin colour, especially in the basal epidermis, sun protection for people with darker skin colours could still be important to reduce photoaging, pigmentary disorders, and the risk of BCC
- critical research gap!!!

MYTH DEBUNKING

- Vitamin D
- Safe slow tanning
- Sunscreens cause cancer
- Paediatric Sun Protection

THANK YOU