

1 | Basic Concept

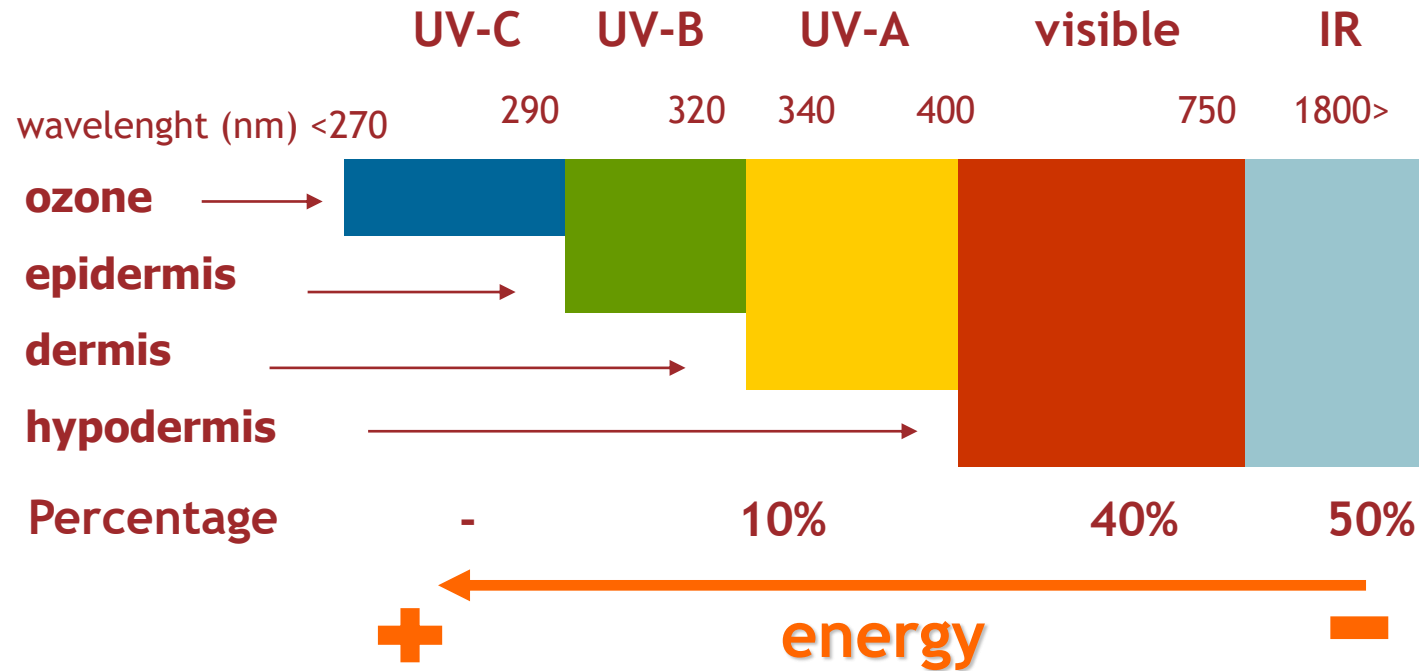
Solar radiation & skin



Basic concepts: Solar radiation & Skin

- Solar radiation and effects on skin
 1. Solar radiation spectrum
 2. Solar radiation effects on skin
 3. Skin's natural defence mechanisms
- Skin photodamage mechanisms
 1. Generation of ROS and cellular oxidative damage
 2. Erythema
 3. Immunosuppression
 4. Solar elastosis, hyperpigmentation and photoaging
 5. DNA damage and skin cancer

1. Solar radiation spectrum



1. Solar radiation spectrum



RADIATION UVB	RADIATION UVA
95% total UV radiation	5% total UV radiation
penetrates to EPIDERMIS	penetrates to DERMIS
incidence ↑summer ↓ winter	incidence uniform throughout year
peak 11.00-18.00 o'clock	all day long
late pigmentation (tanning)	immediate pigmentation
erythema hyperkeratosis immunosuppression DNA damage photocarcinogenesis	formation of ROS: photoaging immunosuppression solar dermatosis photocarcinogenesis



2. Solar radiation effects on skin

In recent years, increasing attention has also been focussed on skin damage caused by visible light and IR

El visible e los IR

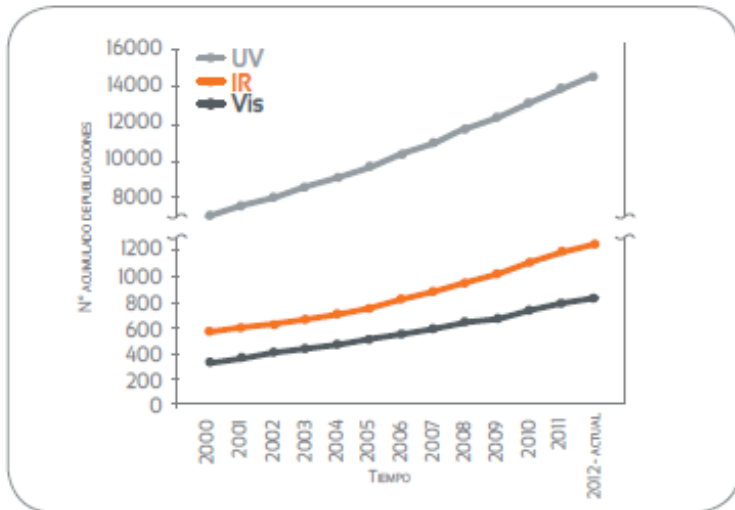
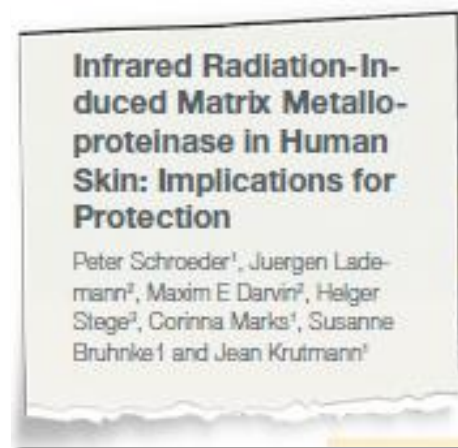


Figura 1. Evolución de las publicaciones sobre la radiación solar.



Effects of ultraviolet radiation, visible light, and infrared radiation on erythema and pigmentation: a review†

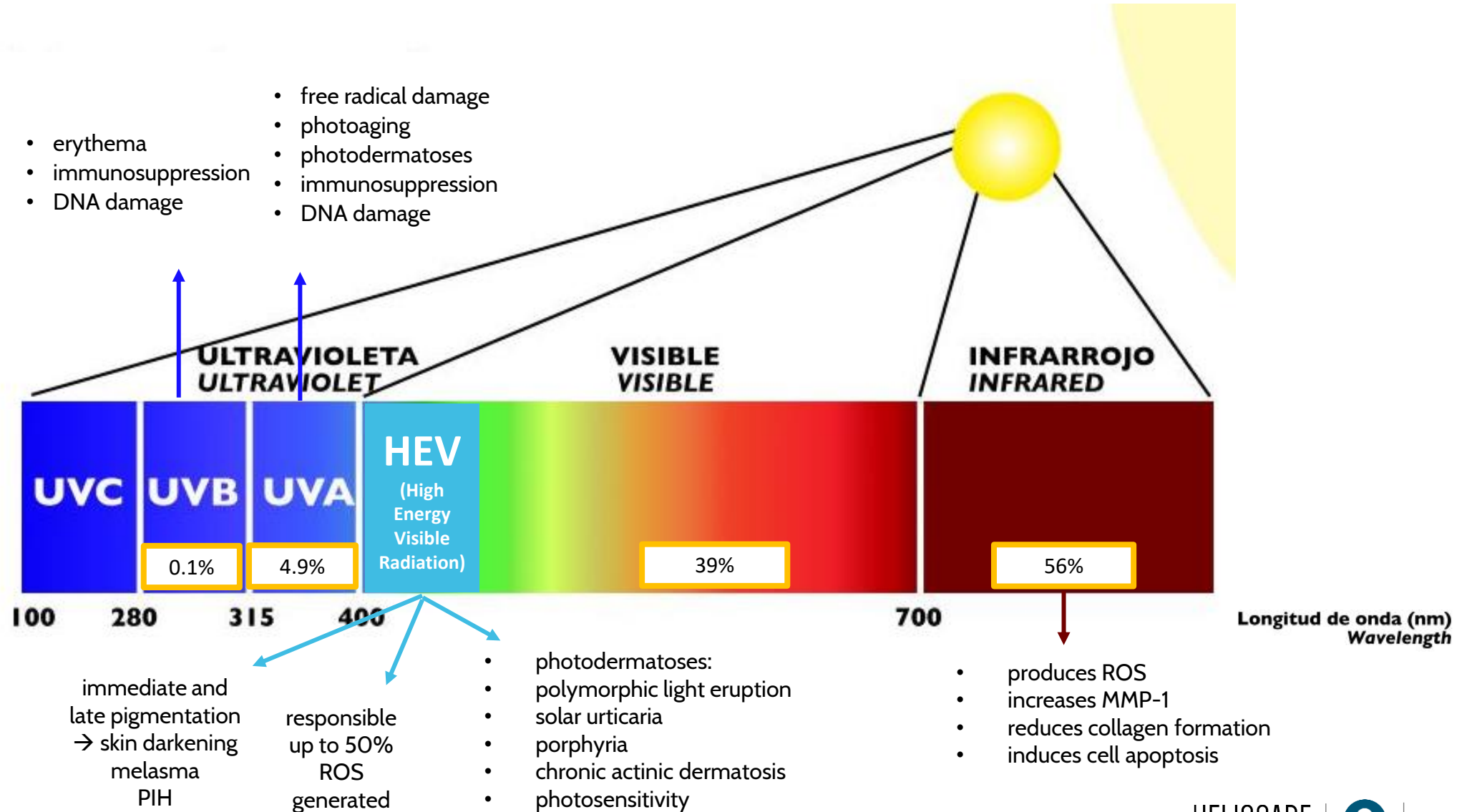
Lindsay R. Sklar, Fahad Almutawa, Henry W. Lim and Iltefat Hamzavi*

Effects of Visible Light on the Skin†

Bassel H. Mahmoud, Camille L. Hexsel, Iltefat H. Hamzavi, Henry W. Lim*. Article first published online: 31 JAN 2008. DOI: 10.1111/j.1751-1097.2007.00286.x © 2008 The Authors

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2. Solar radiation effects on skin



3. Skin's natural defence mechanisms

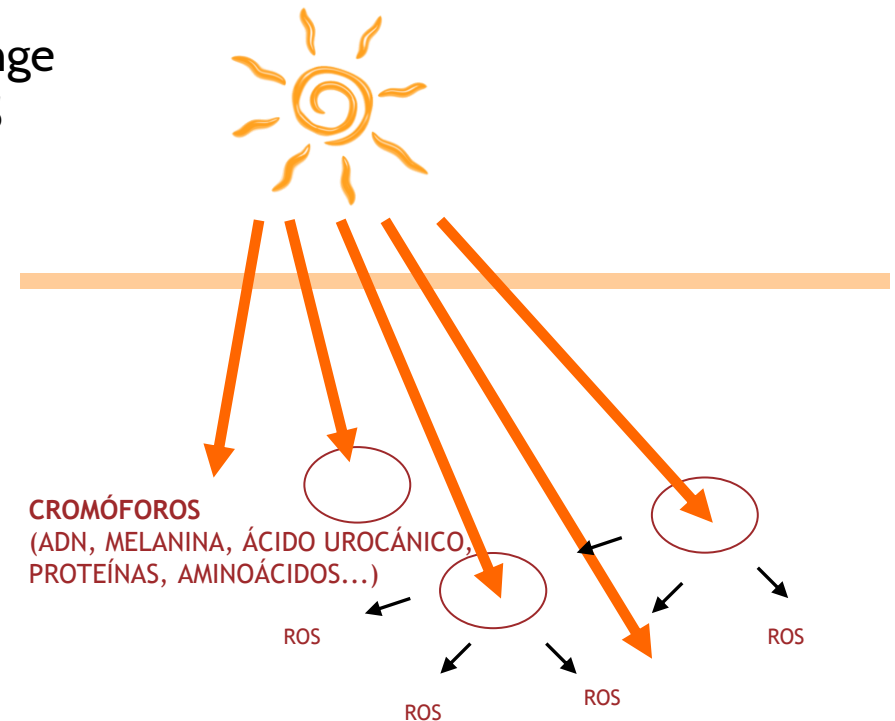
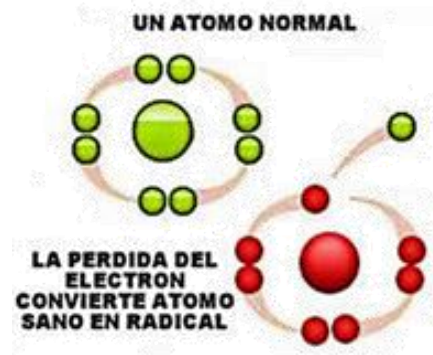
- a. Increase in thickness of stratum corneum and epidermis
- b. Melanogenesis (pigment, DNA protection)
- c. Anti-oxidant processes (protection against free radicals)
- d. Langerhans cells (immunological protection)
- e. DNA repair mechanisms (DNA/cancer protection)

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 1. **Generation of ROS and cellular oxidative damage**
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 4. **Solar elastosis, hyperpigmentation and photoaging**
 5. **DNA damage and skin cancer**

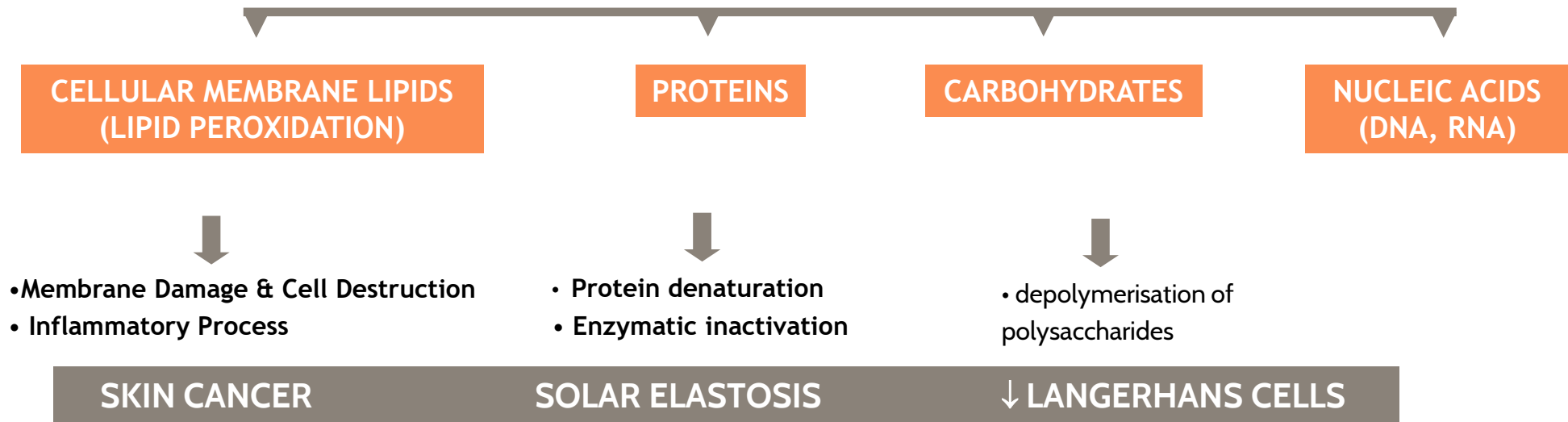
1. Generation of ROS and cellular oxidative damage

Cromophores absorb UV radiation but undergo a chemical change whereby they lose an electron, leading to the formation of ROS (reactive oxygen species).



1. Generation of ROS and cellular oxidative damage

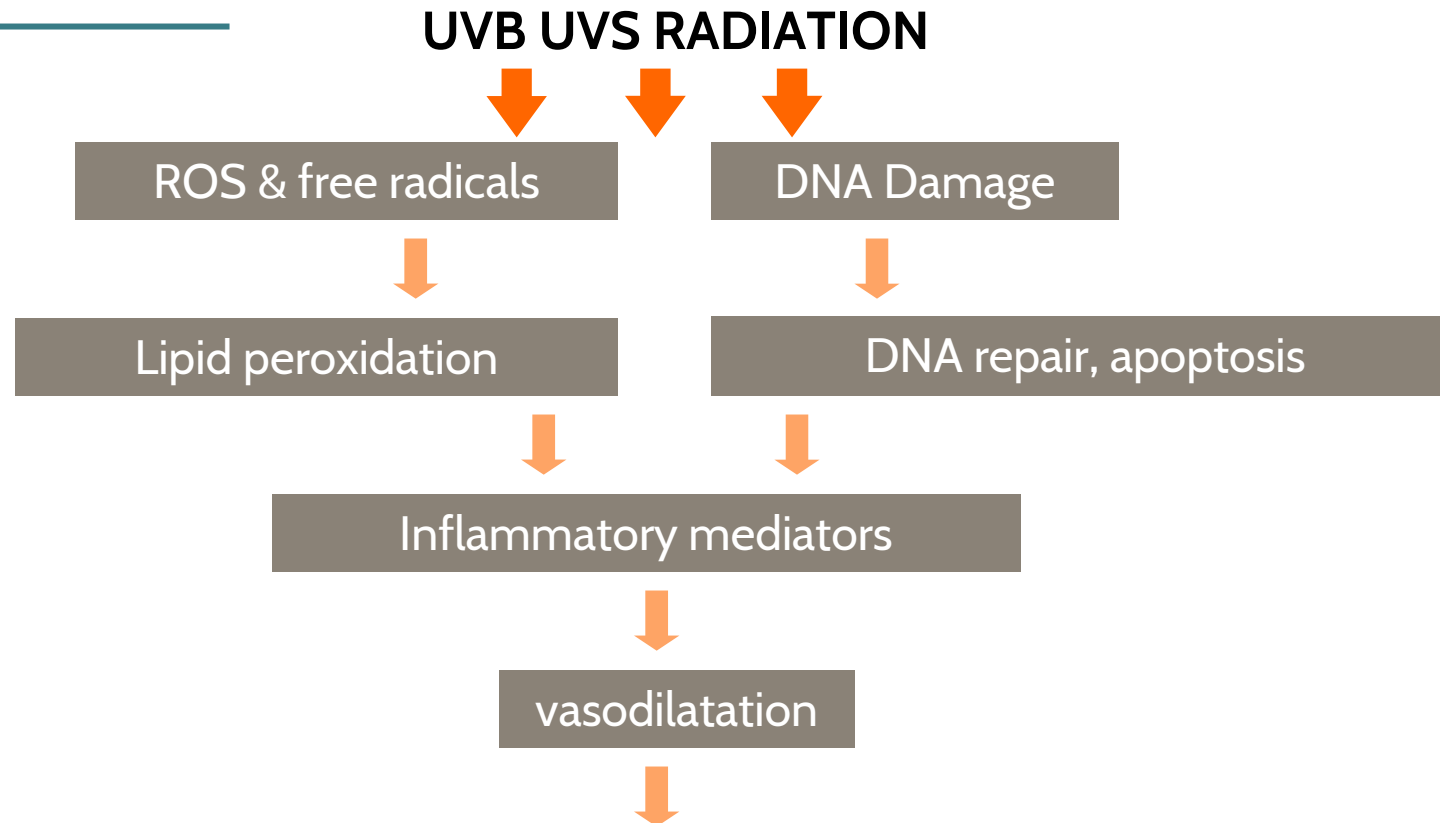
ROS cause damage to:



ROS also increase

Inflammation → Skin aging
MMPs → Hyperpigmentation
Melanin production

2. Erythema

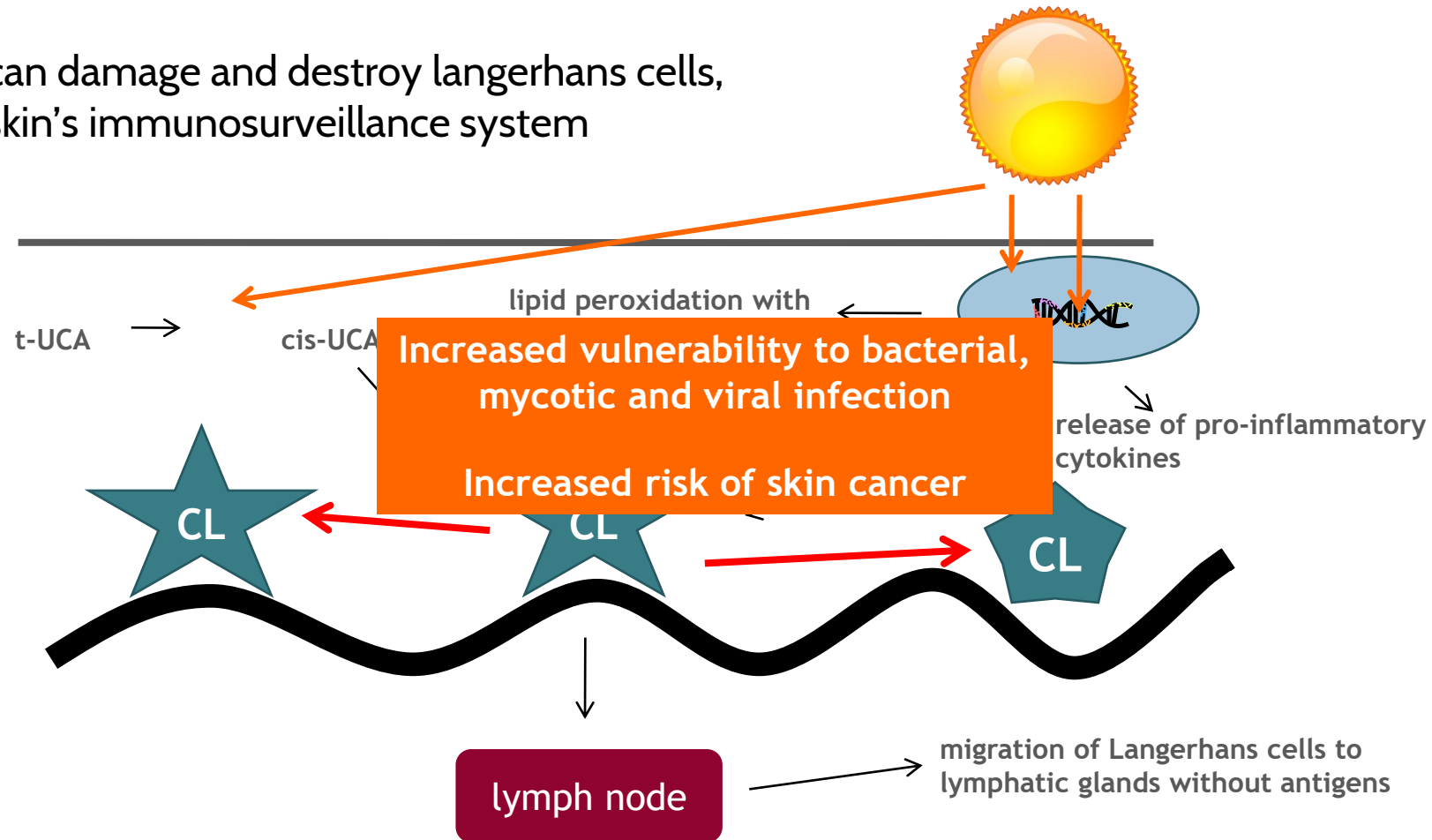


ERITHEMA

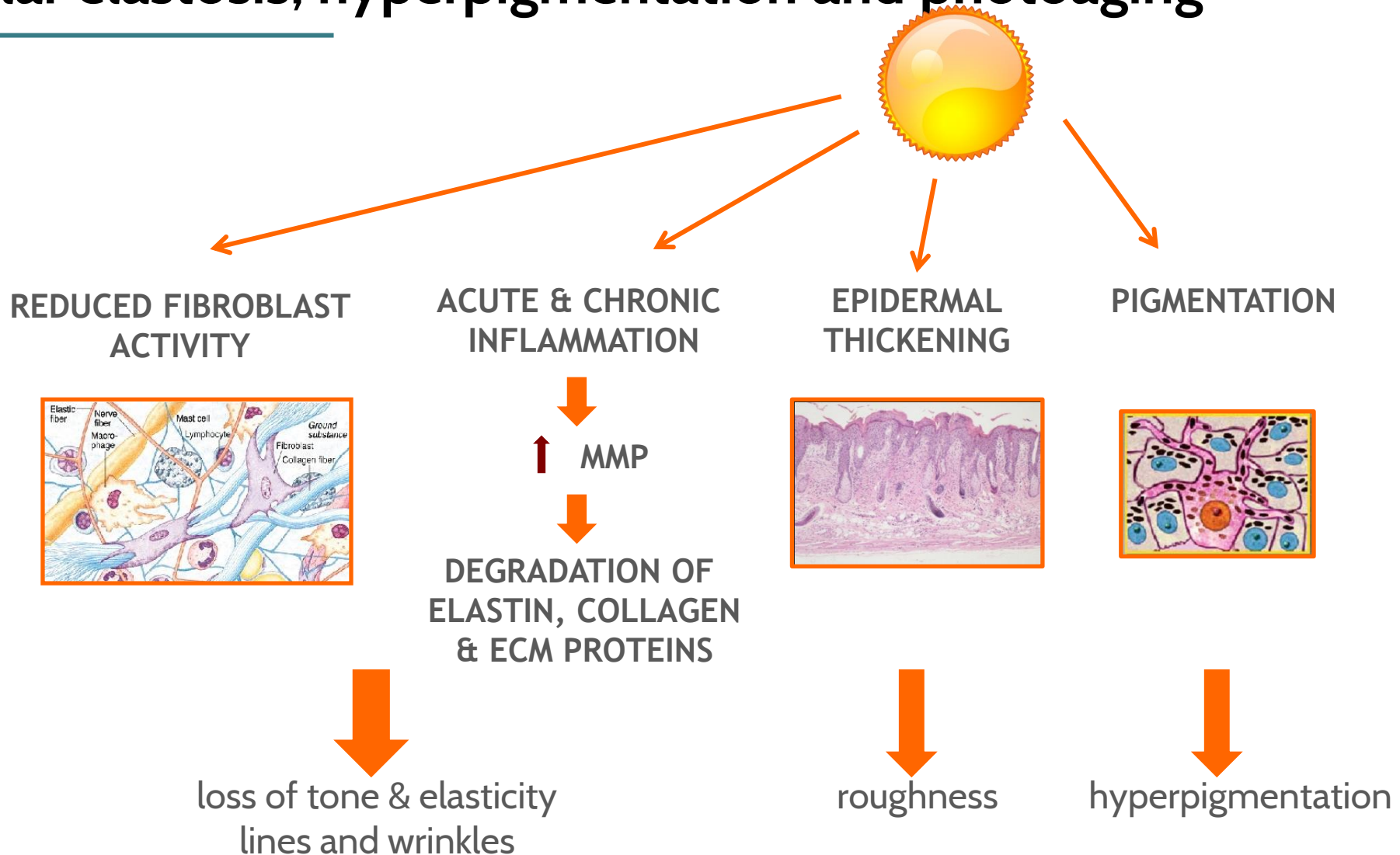
Erythema response is common in all skin types, and peaks between 6 - 24 h.

3. Immunosuppression

UV radiation can damage and destroy langerhans cells, reducing the skin's immunosurveillance system



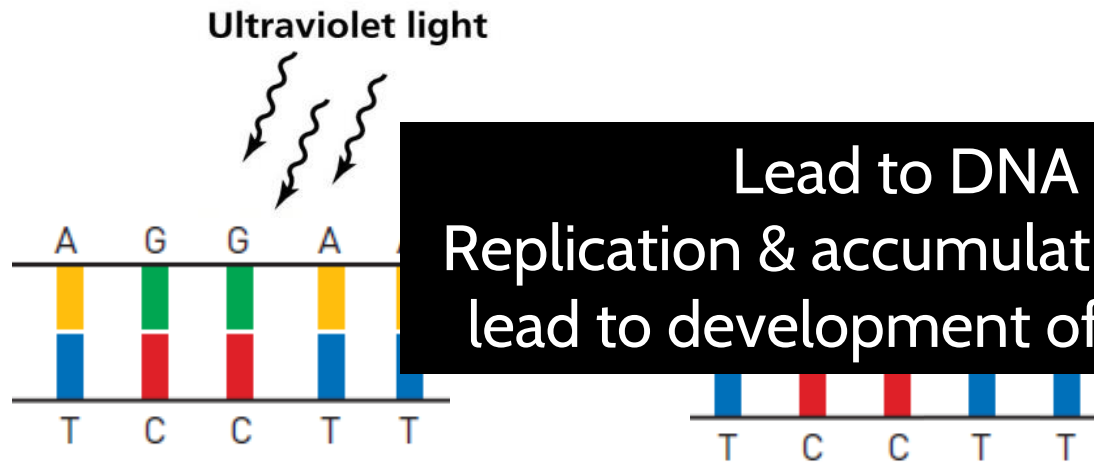
4. Solar elastosis, hyperpigmentation and photoaging



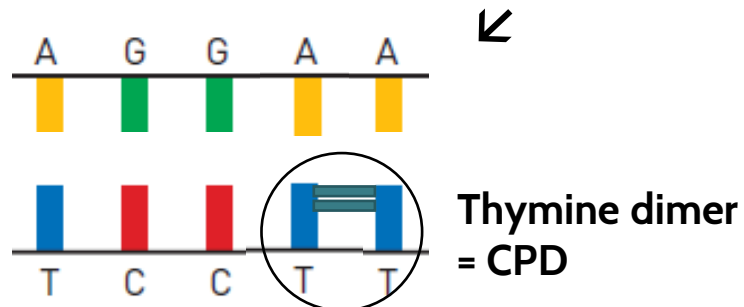
5. DNA damage and skin cancer

DIRECT

- DNA acts as a chromophore, absorbing **UVB** radiation



Lead to DNA mutation.
Replication & accumulation of mutations can
lead to development of AK and skin cancer



INDIRECT

- UVA** causes oxidative damage to nucleic acids

on forms = oxidation of
of 8-oxo-dGuanine

