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The role of natural lipids in defending skin against environmental stress

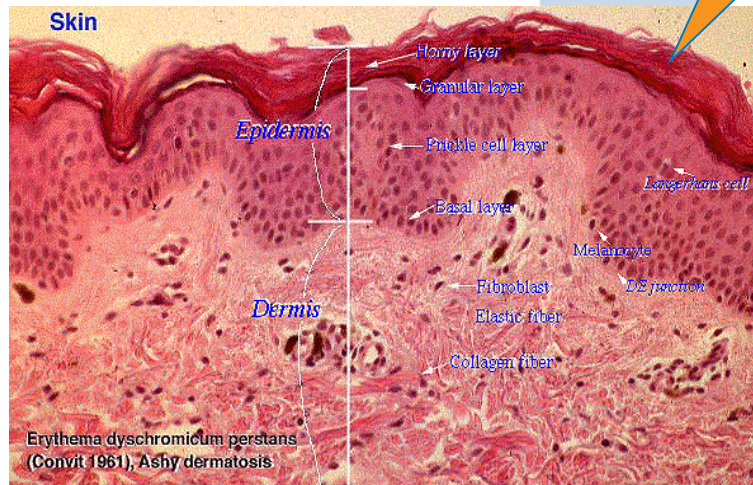
Skin stress: environment and genetics

Chronological aging - related to genetic factors

- Decreased antioxidative capacity
- Increased protease activity
- Decreased metabolic activity
- Loss of elasticity and thinning

Photoaging - environmental insults and oxidative stress

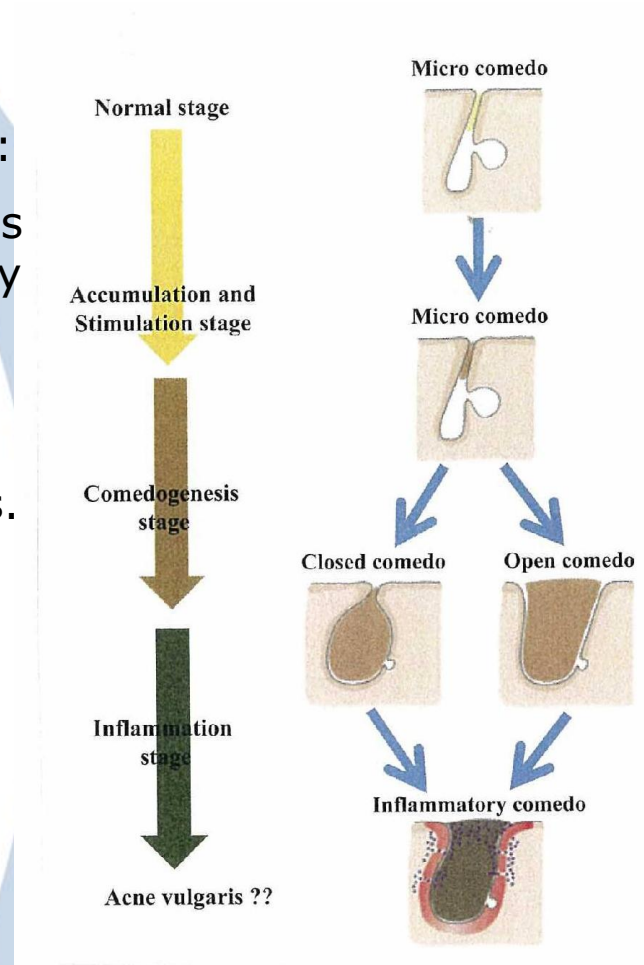
- Free radicals & ROS
- Main targets: lipids, nucleic acids, proteins
- Increased activity of proteases
- Reduced synthesis of collagen
- Decreased antioxidant capacity
- Induction of inflammation



Correlation between lipid peroxides and acne vulgaris

T Tochio* et al. demonstrated:
 Accumulation of lipid peroxides (LPO) involved in inflammatory changes in comedones
 This seems to play an important role in the progression of comedogenesis.
 This may further lead to inflammatory changes in acne vulgaris.

* Journal of Cosmetic Dermatology, 2009, 8, 152-158,



Low LPO quantity

Increase in LPO and upregulation of IL-1 α

Proliferation and hyperkeratinisation induced by IL-1 α

Accumulated sebum obstructed from getting secreted

Excess amount of LPO is involved in inflammatory changes

The two types of epidermal skin lipids

Skin surface lipids

Natural protection against external aggressions

- Sebaceous lipids (triglycerides, wax esters, squalene, FFA, cholesteryl esters)

Epidermal barrier lipids

Critical for barrier function and water holding capacity

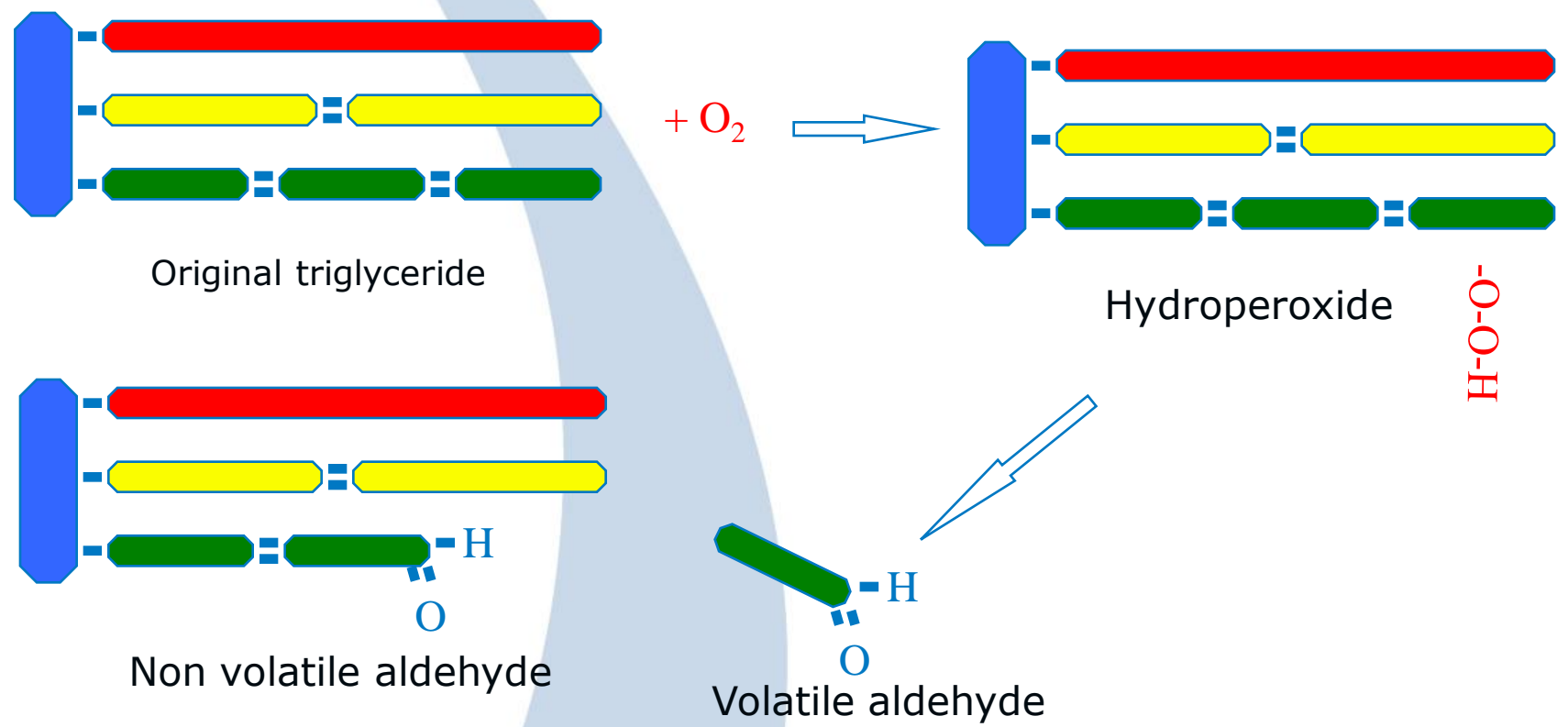
Stratum corneum lipids are secreted from lamellar (Odland) bodies

- Ceramides (~25%), FFA (~25%), cholesterol (~20%)

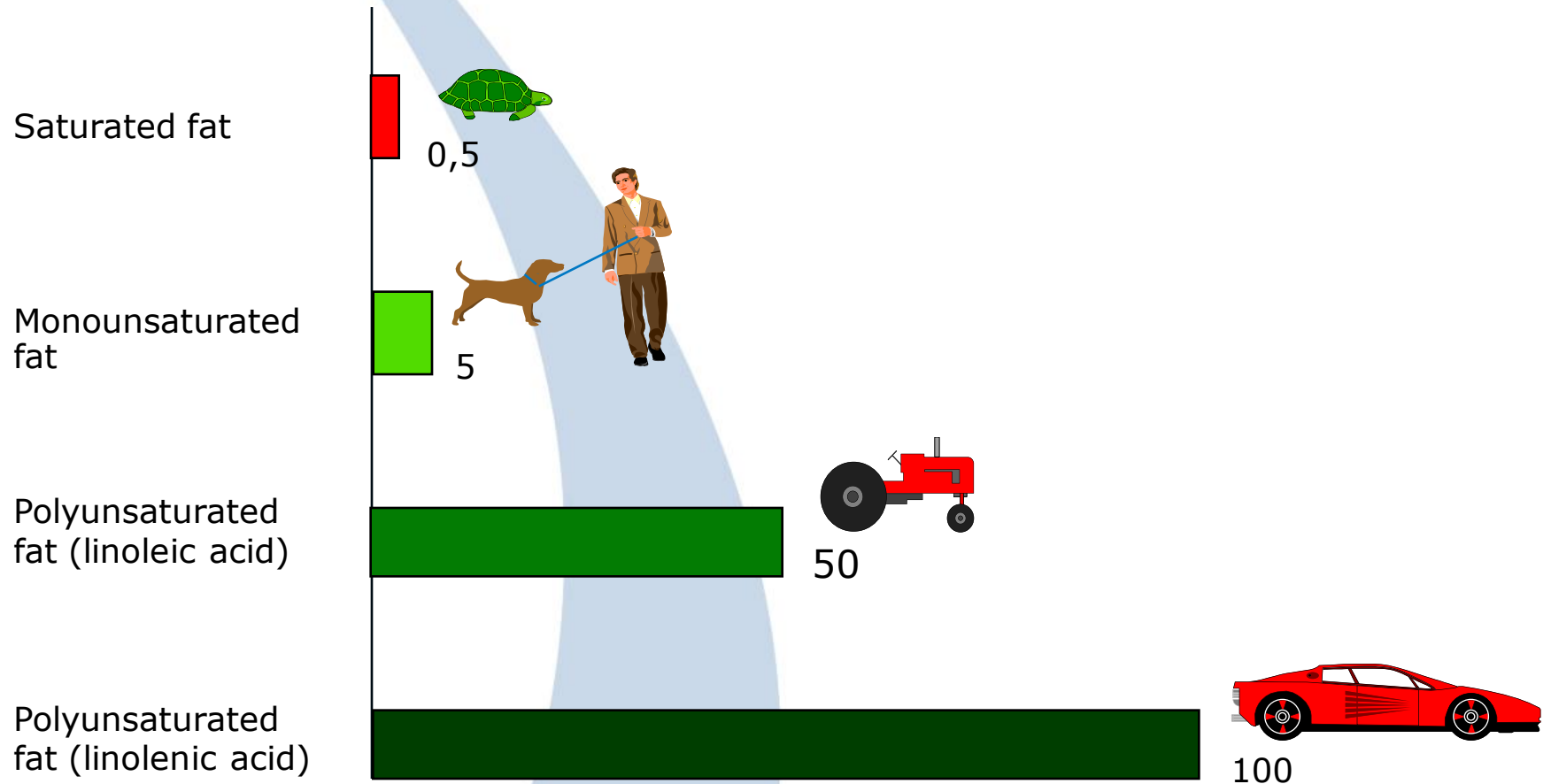
Total lipid content and type of lipids of importance for barrier function

Degeneration of barrier results in imbalance and inflammatory state

Breakdown of unsaturated lipids Oxidation



Oxidation rate



Tocopherols are multifunctional

- ◆ Oil soluble antioxidants
 - Free radical scavengers, improving shelf life of formulation
 - ◆ Antioxidants in cell membranes and intercellular lipid lamellae
 - ◆ Membrane stabilising by reduced lipid peroxidation
 - ◆ Free radical scavenger (anti-oxidant effects):
 - Alpha-T > Gamma-T
 - ◆ Anti-inflammatory agents
 - Gamma-T > alpha-T
 - ◆ Natural tocopherol isomers are often more effective than synthetic tocopherols
 - ◆ Synergistic effects with Vit.C, selenium, carotenes, sterols etc
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Protection against photo-oxidation - photo-oxidation study

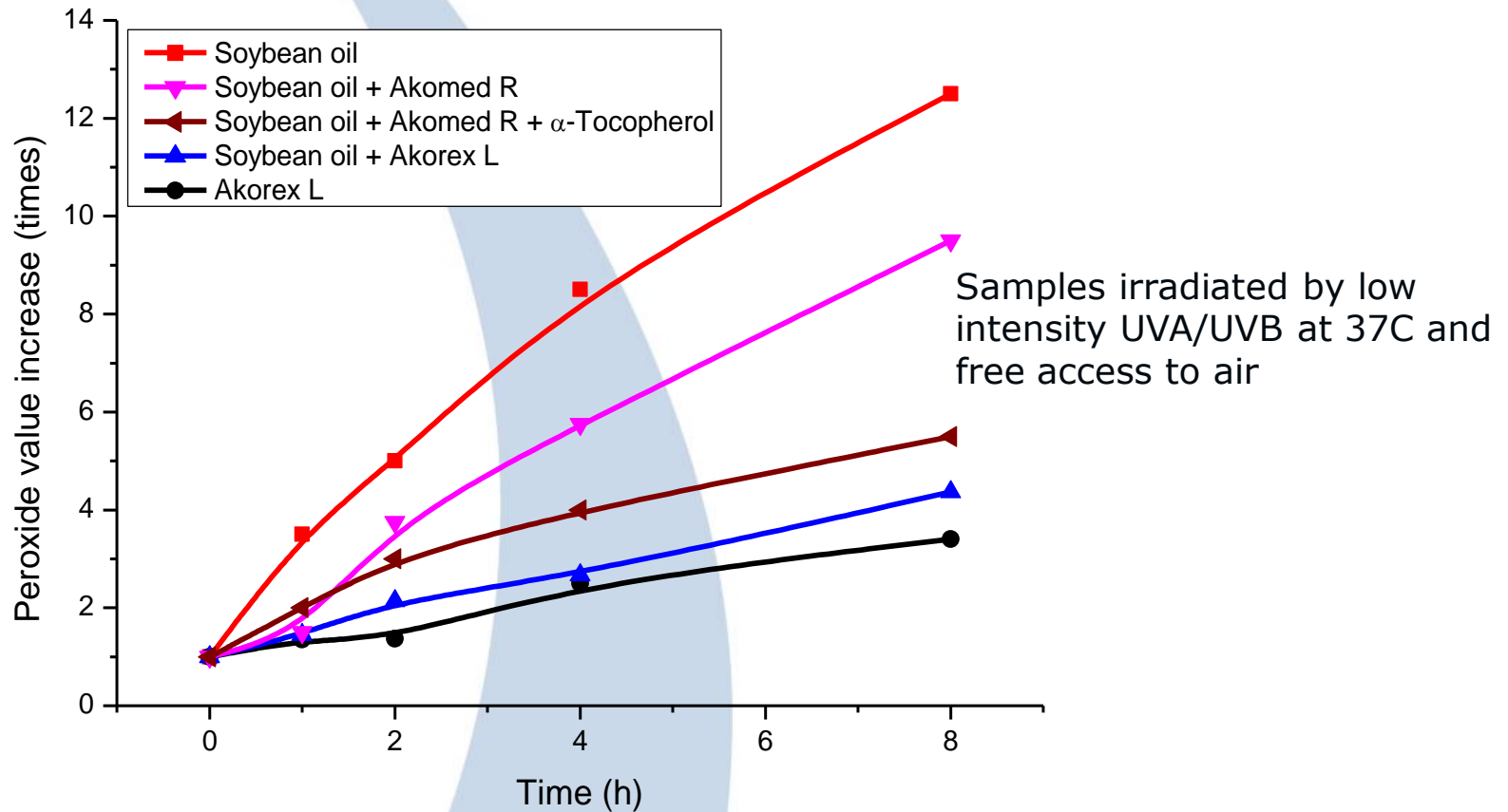
Skin lipids are rich in polyunsaturated fatty acids

Soybean oil was selected as a model source of linoleic (C18:2) and alpha-linolenic (C18:3) fatty acids

Oil samples were subjected to open air and intense light (including UVB) at 37 °C corresponding to a moderately sunny day at outdoor conditions

Light exposure for 8 hours, monitoring peroxide value and breakdown of tocopherols

Akorex L stabilises unsaturated fatty acids against photo-oxidation



Evaluation of antioxidative properties in skin models



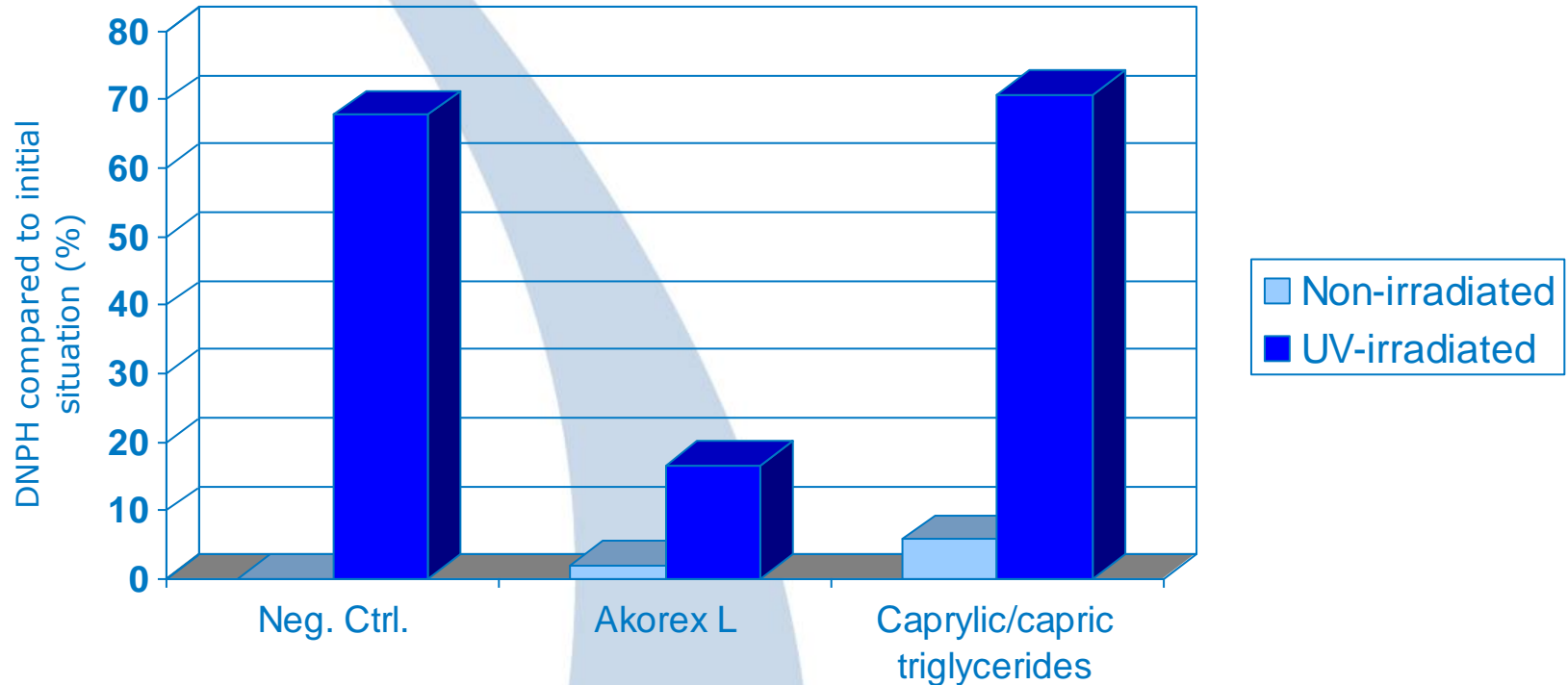
Human skin model test

Oxidative stress induced by UV-irradiation, 60 min at RT, simulating in vivo use conditions

Three indicators of oxidative stress were evaluated

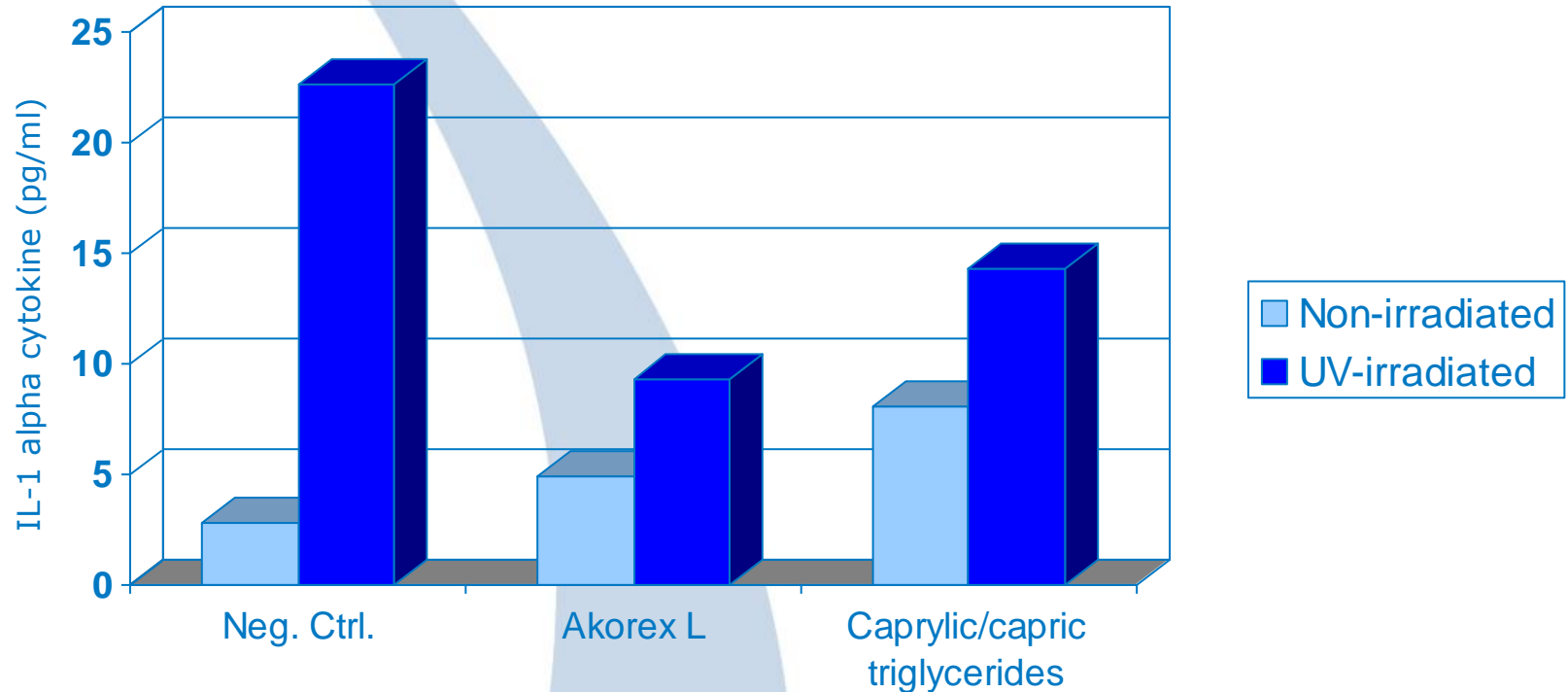
- Protein oxidation caused by reactive oxygen species
 - Inflammatory reaction induced by oxidative stress
 - Cell viability evaluating the membrane integrity (not shown)
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Antioxidant efficacy of Akorex L



Akorex L protects the reconstructed human epidermis cells, expressed as the reduction of carbonyl protein formation.

Antioxidant efficacy of Akorex L



Akorex L protects the reconstructed human epidermis cells, shown as a decreased release of IL-1 α cytokine.

Conclusions



Reactive oxygen species and free radicals are a common cause for skin stress – by oxidation and by inducing stress mechanisms

Active emollients with natural tocopherols and phytosterols can reduce the oxidation of skin components

Tocopherols and phytosterols can also reduce the inflammation caused by free radicals and reactive oxygen species

NATURAL LIPIDS CAN DEFEND THE SKIN AGAINST ENVIRONMENTAL STRESS!
