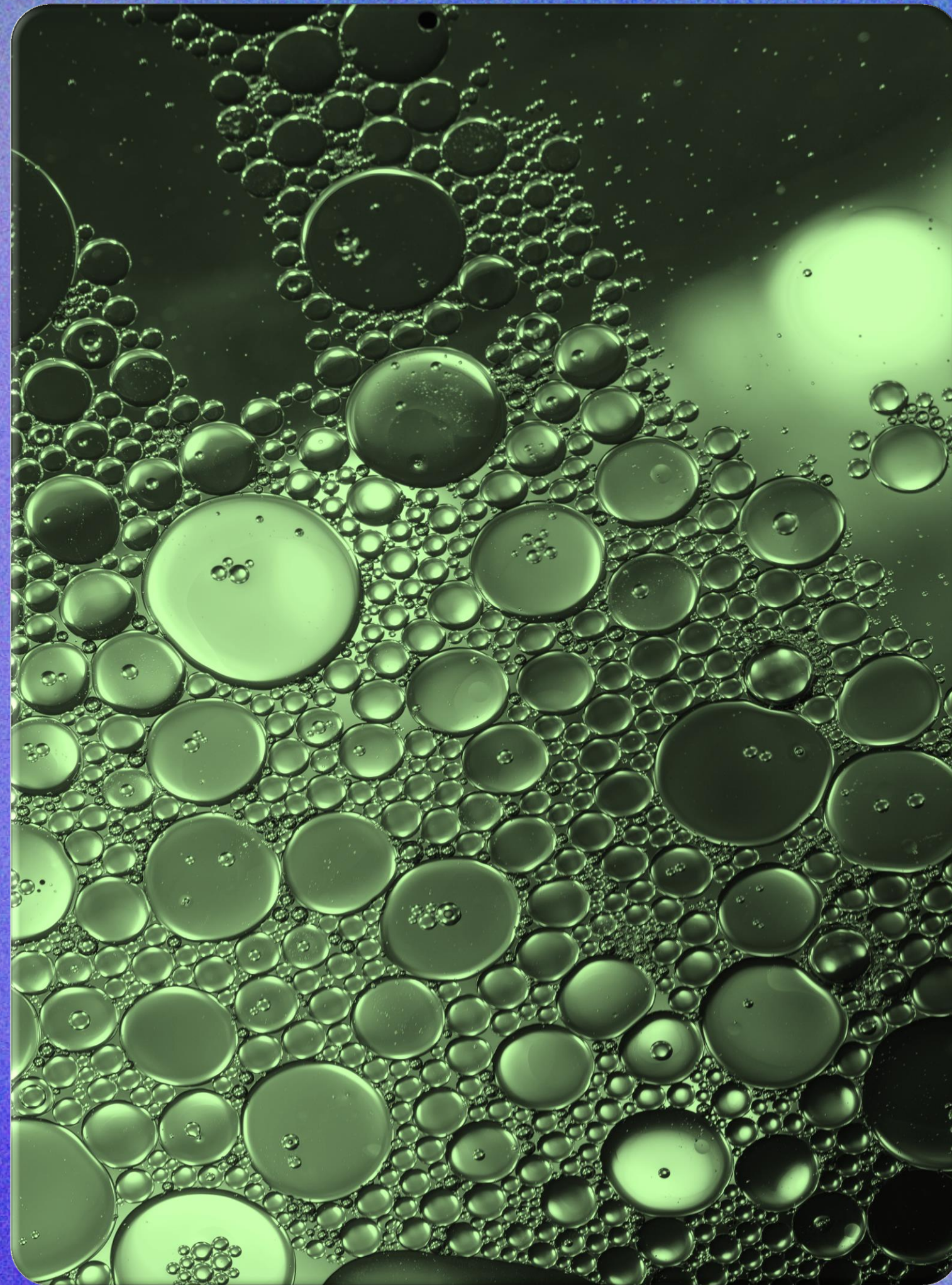




The technological revolution in **personalized cosmetic ingredients**

LUTEOLIN_10



Cutting-edge solutions for a technologically demanding sector.

OPTIDEL offers an advanced solution to dissolve and concentrate natural active ingredients with low stability and insolubility, significantly enhancing their bioavailability and efficacy.



Ready-to-use technology for formulation:

Versatile solutions for both hydrophilic and hydrophobic ingredients, even the most unstable or poorly soluble compounds.



Enhances bioavailability and efficacy:

Maximizes stability by up to 90%, increases skin bioavailability by up to 60%, and multiplies efficacy up to fourfold.



Sustainability driven by innovation:

Technological solutions that enable cleaner, more efficient formulations with a lower environmental impact.



Adapted to today's market:

Protects actives from degradation and enables the development of customized formulas aligned with the latest trends.

Luteolin_10

Depigmenting and antioxidant shield.

Reveals radiant, even-looking skin, reduces dark spots, and protects against environmental stress.



The skin is constantly exposed to environmental aggressors that trigger oxidative stress and chronic inflammation, leading to uneven pigmentation.

*The exposome and other factors
cause **irregular pigmentation***



UV radiation and visible light
Sun spots



Inflammation and skin damage
Post-inflammatory spots



Hormonal changes
Melasma



Environmental exposure
Oxidative stress



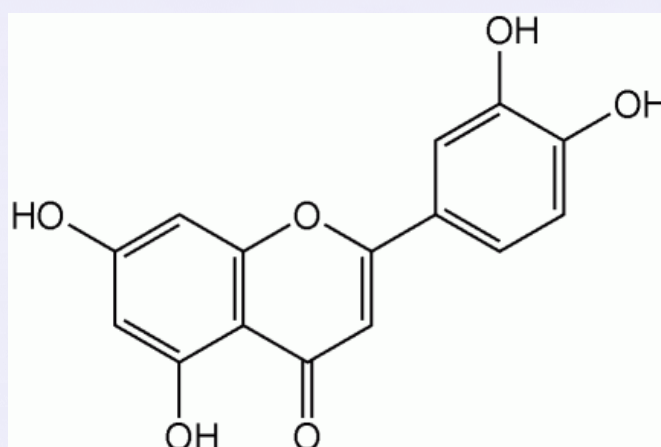
These factors stimulate melanocytes and disrupt pigmentation.

Luteolin_10

Luteolin ($C_{15}H_{10}O_6$) is a plant-derived flavonoid belonging to the flavone family, recognised for its powerful biological activity in the regulation of cellular stress. Naturally present in various botanical species, such as *Sophora japonica*, it stands out for its ability to interact with key molecular pathways involved in inflammation, oxidative stress, and irregular pigmentation.

In dermatology and cosmetics, luteolin helps combat oxidative stress, chronic inflammation, and the appearance of dark spots. It limits cellular damage, protects the extracellular matrix, and helps regulate melanin production for a more even-looking skin tone.

As a result, it combines antioxidant, soothing, and brightening action, making it an ideal botanical active for formulas designed to enhance radiance, even out skin tone, and protect against the exposome.



Optidel technology enables a high concentration of active ingredient to be incorporated while keeping it stable and bioavailable, thereby enhancing its efficacy.



Thanks to its structure, it provides the easiest way to add luteolin from *Sophora japonica* to a wide range of cosmetic formulations.

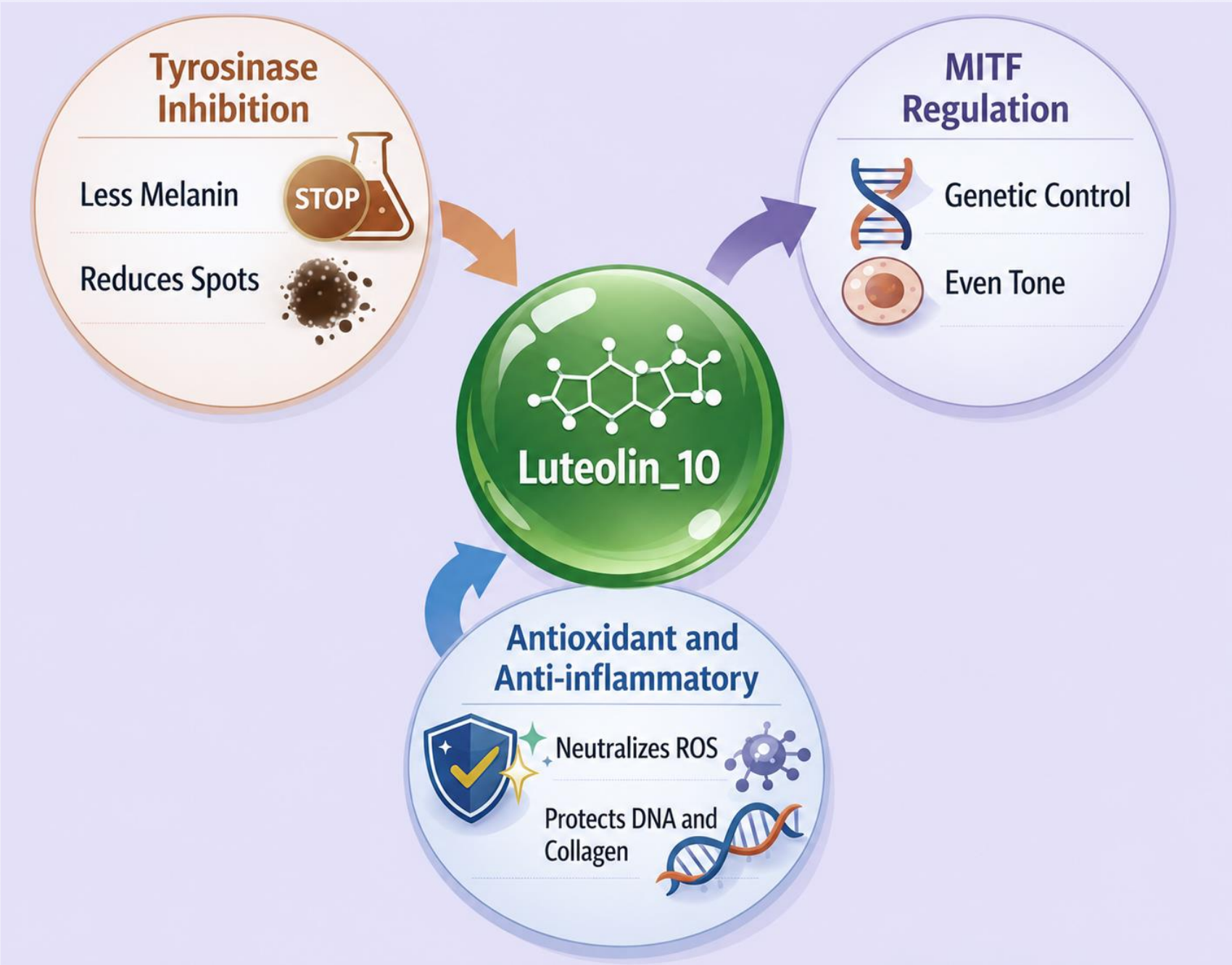


Biologically precise ingredient that targets the two drivers of skin ageing: oxidative stress and chronic inflammation.



Intelligent botanical defense against oxidative stress and chronic inflammation responsible for skin ageing.

How does it work?



Tyrosinase inhibition

Luteolin binds to tyrosinase, blocking its function.

Reduces melanin accumulation in melanocytes.

Helps prevent the formation of dark spots and localized pigmentation.

MITF regulation

MITF controls the genes responsible for melanin production in melanocytes.

Luteolin modulates MITF expression, regulating melanogenesis at the genetic level and promoting a more even-looking skin tone.

Antioxidant and anti-inflammatory activity

Neutralizes free radicals and reactive oxygen species (ROS).

Reduces inflammatory mediators that stimulate post-inflammatory pigmentation.

This helps protect the skin from dullness, inflammation, and environmental stress, keeping it clearer, calmer, and more radiant.

1. Gendrisch F, Esser PR, Schempp CM, Wölfle U. Luteolin as a modulator of skin aging and inflammation. BioFactors. 2021;47:170–180. <https://doi.org/10.1002/biof.1699>

2. Mahdiani S, Omidkhoda N, Heidari S, Hayes AW, Karimi G. Protective effect of luteolin against chemical and natural toxicants by targeting NF-κB pathway. BioFactors. 2022;48(4):744–762. <https://doi.org/10.1002/biof.1876>

3. deLima Cherubim DJ, Buzanello Martins CV, Oliveira de Fariña L, daSilva de Lucca RA. Polyphenols as natural antioxidants in cosmetics applications. J Cosmet Dermatol. 2020;19:33–37. <https://doi.org/10.1111/jocd.13093>

4. Choi, M.Y., Song, H.S., Hur, H.S. et al. Whitening activity of luteolin related to the inhibition of cAMP pathway in α-MSH-stimulated B16 melanoma cells. Arch. Pharm. Res. 31, 1166–1171 (2008). <https://doi.org/10.1007/s12272-001-1284-4>

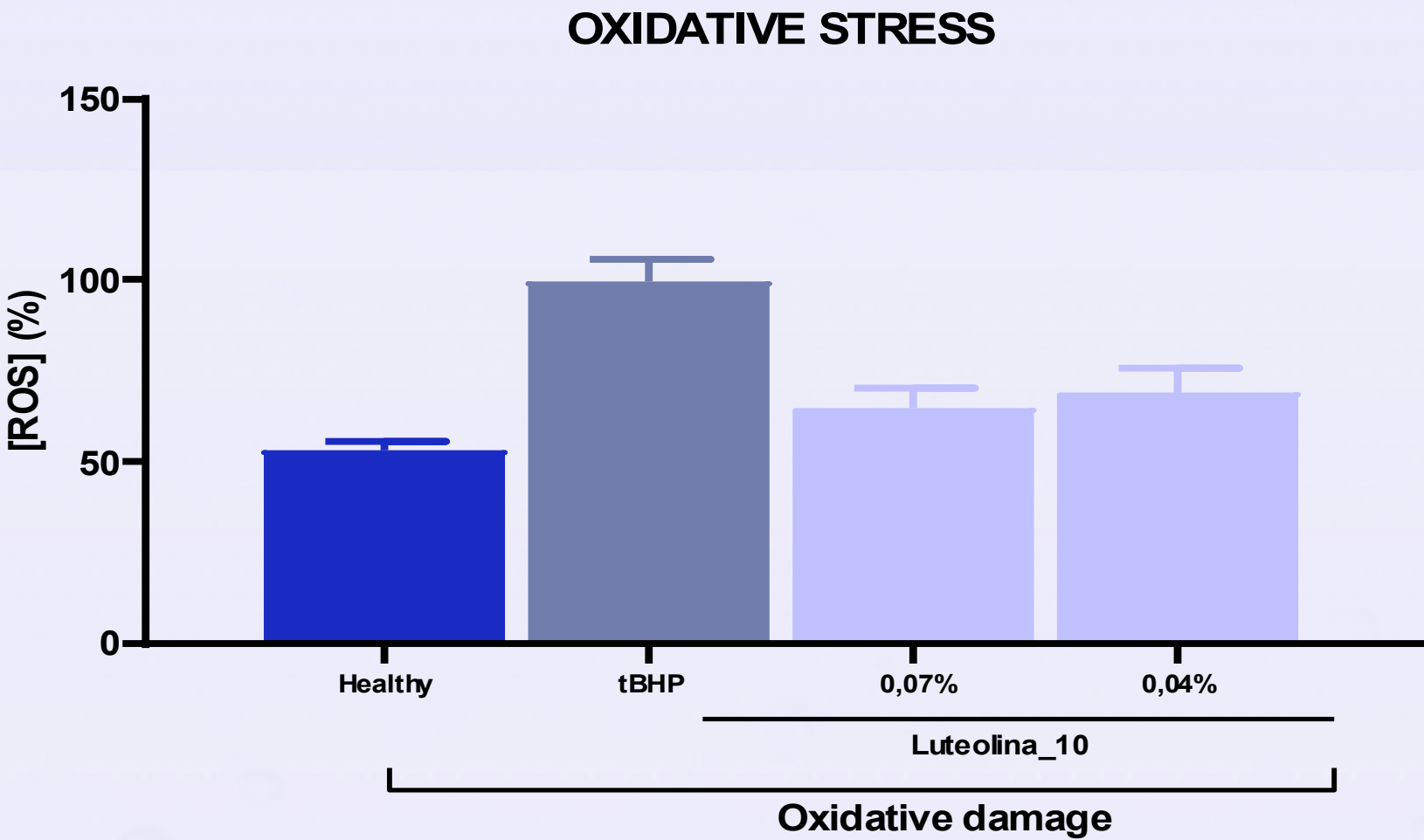
5. Xu, Ziqian, Xie, Yihui, Song, Jun, Huang, Juntao, Shi, Weimin, Mechanism of Action of a Chinese Herbal Compound Containing Quercetin, Luteolin, and Kaempferol in the Treatment of Vitiligo Based on Network Pharmacology and Experimental Verification, Evidence-Based Complementary and Alternative Medicine, 2022, 7197533, 14 pages, 2022. <https://doi.org/10.1155/2022/7197533>

Antioxidant effect: ROS activity assay

Luteolin_10 significantly reduces ROS production under induced oxidative stress conditions, demonstrating potent cellular antioxidant activity.

- Luteolin_10 shows an improvement of up to 163% compared to healthy cells, positioning this ingredient as a powerful anti-oxidative stress active for high-performance formulas.
- At concentrations of **0.04–0.07%**, Luteolin_10 reduces ROS levels by approximately 40% compared to healthy cells, meaning it improved the cell’s basal state.

These results position Luteolin_10 as a highly effective active ingredient for cellular protection against oxidative stress, helping to limit processes associated with chronic inflammation and premature ageing induced by the exposome.



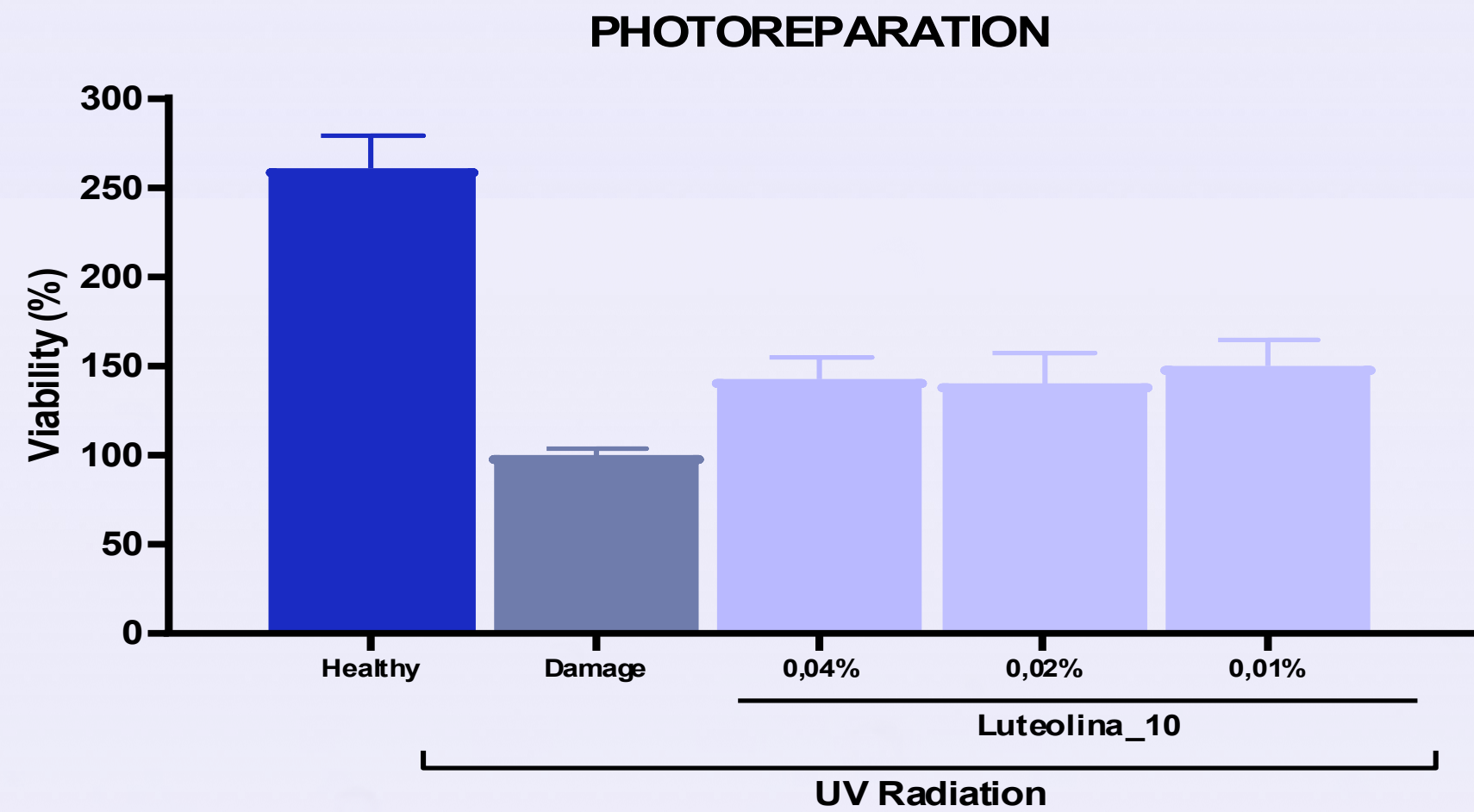
ROS production (percentage) in the HaCaT keratinocyte cell line obtained in the antioxidant assay after 4 hours of exposure to tBHP with the test ingredient at the indicated percentages. The positive control, tBHP insult, represents cells exposed to the oxidizing agent tBHP alone. Bars represent the mean of six technical replicates from an independent assay.

Photorepair Activity

Luteolin_10 promotes the recovery of cell viability after UV radiation-induced damage, significantly increasing cell survival compared to the damaged control.

- The ingredient demonstrates photorepair activity even at very low concentrations (0.01–0.04%), showing high biological efficiency.
- Luteolin_10 increases cell viability, restoring approximately 35–40% of the cell viability lost after UV damage.

These results support the use of Luteolin_10 as an active ingredient capable of supporting cellular repair mechanisms against photostress and contributing to the prevention of skin photoageing.



In-vitro assay performed on human keratinocytes (HaCaT) to evaluate repair capacity against sun-induced damage. Cells were irradiated with simulated sunlight and treated with different concentrations of the compound for 24 hours. Cell viability was measured using the MTT assay.

Benefits of Luteolin_10 against Oxidative Stress and Skin Inflammation

Luteolin_10 is the ideal ally against modern skin stress: it regulates oxidative stress and soothes microinflammation, promoting more balanced, resilient, and comfortable skin

✿ **Antioxidant regulation of oxidative stress:** Luteolin_10 significantly reduces the production of reactive oxygen species (ROS), helping to restore cellular redox balance and protecting cells against oxidative damage induced by exposome-related factors.

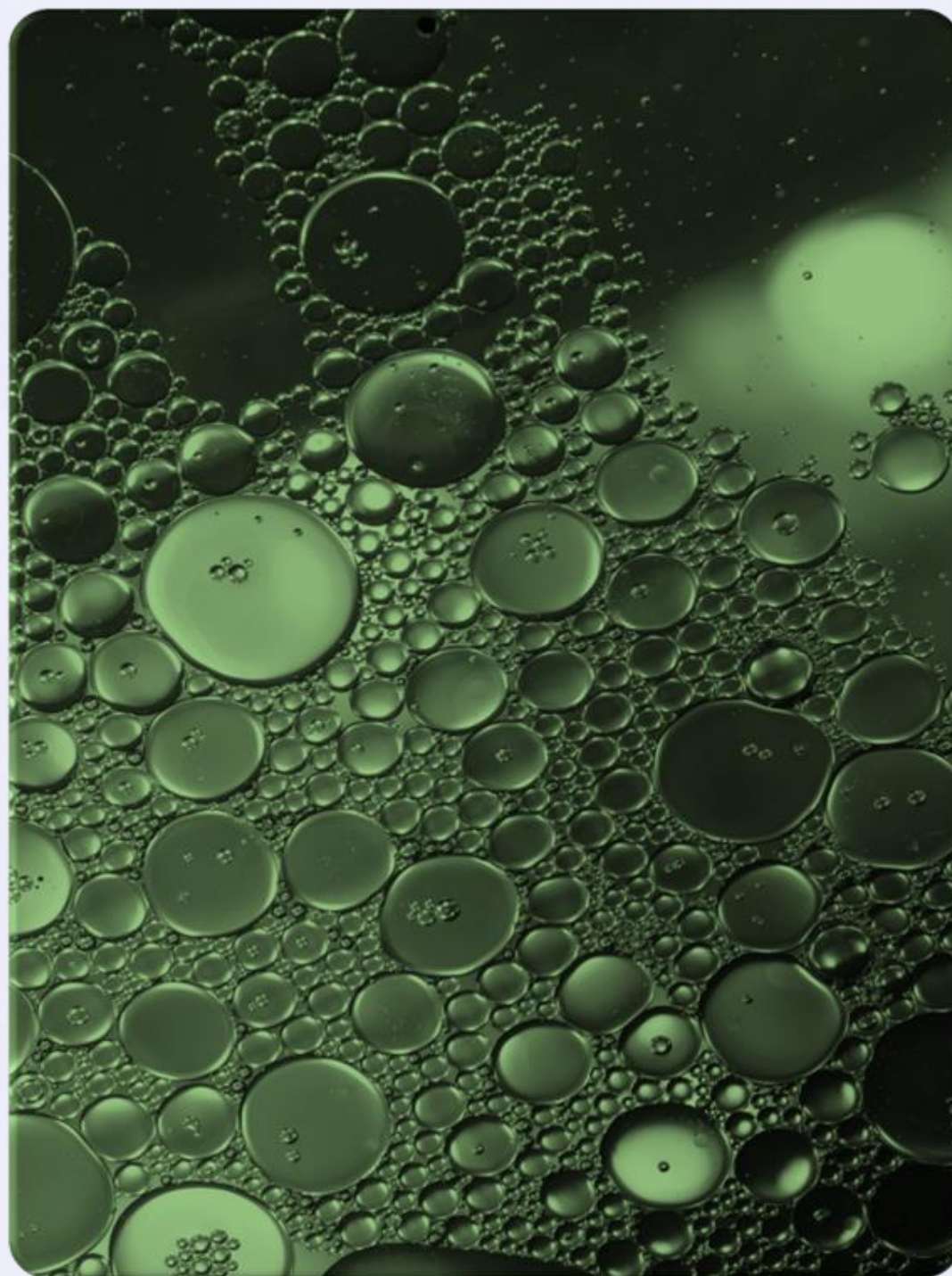
✿ **Control of skin inflammation:** Its modulatory action on inflammatory mediators helps reduce chronic microinflammation responsible for skin sensitivity and reactivity, promoting calmer and more balanced skin.

✿ **Protection against environmental stress:** By acting on the main biological triggers of skin stress, Luteolin_10 helps reinforce the skin's tolerance to external aggressors such as pollution, UV radiation, and environmental stress.

✿ **Prevention of premature ageing:** The combined regulation of oxidative stress and inflammation helps preserve cellular integrity and limit processes associated with exposome-induced skin ageing.

✿ **Restoration of skin balance:** Thanks to its dual antioxidant and soothing action, Luteolin_10 acts as a cellular stress modulator, promoting more resilient, even-looking, and comfortable skin against daily aggressors.





Luteolin_10: LTN_10

Application:

Luteolin_10 is a versatile, high-performance ingredient for anti-ageing creams and serums, soothing and anti-redness treatments for sensitive skin, skincare products for oily and reactive skin, and gentle brightening or tone-evening products.

Recommended dosage:

0,5% - 2%

Formulation tips:

Add to the bulk during the final stage of the production process, ensuring that the temperature does not exceed 40°C.
Add to the mixture and maintain under stirring until homogeneous.

Active % (w/w):

Total Luteolin: $\geq 9\%$

INCI Name:

INCI Name: Propylene Glycol, Dimethyl Isosorbide, Poloxamer 407, Luteolin.



Optidel Biosystems SL

Parque tecnológico, edificio 202

48170 Zamudio, Bizkaia

Tel: + 34 673 76 74 24

info@optidelbiosystems.com