LIPODISQ®

Direct Dermal Delivery, Superior Stabilisation

OXYRESVERATROL

Lightening, Brightening, Complexion Control

Foreword

At Malvern Cosmeceutics, we empower UK and international manufacturers and brand owners—large and small—by using our proprietary Lipodisq® delivery system. Our mission is rooted in scientific curiosity and a relentless drive to innovate, deepening our understanding of both the products we offer and the ones we're shaping for the future. We're not just pushing boundaries for ourselves—we're advancing the entire cosmeceutical industry, with a focus on safe, effective, and cutting-edge product development that ultimately benefits the customers it serves.

In developing Lipodisq® Oxyresveratrol formulations, we partnered with two visionary brands—RE:ERTH (Singapore) and MDH Skincare (UK)—to ensure exceptional product efficacy and scientific integrity. Both partners share our commitment to innovation, sustainability, and personalized skincare. By harnessing advanced biotechnology combined with rigorous clinical evaluation, they have created high-performance solutions that act at the cellular level, delivering targeted results with precision and care.

RE:ERTH

Based in Singapore, led by Shinji Yamasaki and Toh Ziling, and first to launch a Lipodisq® Oxyresveratrol based product. RE:ERTH is a science-driven skincare brand rooted in nature and backed by nearly two decades of research. With a focus on minimalist routines and long-term skin health, RE:ERTH formulates gentle yet highly effective products using exclusive ingredients like Japanese White Turmeric (*Curcuma zedoaria*). Their commitment to sustainability, university-backed science, and advanced dermal delivery systems, including Lipodisq®, positions them at the forefront of modern skincare innovation.

MDH Skincare is a UK-based brand dedicated to delivering clinically effective, results-driven formulations for common skin complaints. With a focus on aesthetic-grade actives and streamlined routines, MDH combines dermatological insight with advanced delivery technologies, including Lipodisq®, to create products that target pigmentation, aging, and skin resilience. 'LYSA' was the first UK product launched to contain Lipodisq® Oxyresveratrol.
Led by Mr Dalvi Humzah a Consultant Plastic, Reconstructive, and Aesthetic Surgeon. Dalvi is a key opinion leader in the aesthetic industry and serves as co-editor of the PMFA Journal. He is internationally recognized for his contributions to facial anatomy education, advanced injectable techniques, and cosmetic innovation.

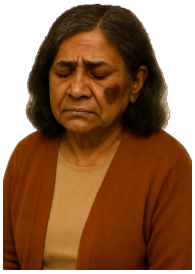
Oxyresveratrol

Oxyresveratrol is a powerful tyrosinase inhibitor and anti-oxidant known for its brightening and anti-aging properties—its poor solubility and instability have long limited its potential. Lipodisq® technology transforms this challenge into opportunity, encapsulating oxyresveratrol in ultra-small, biodegradable particles that enhance skin penetration, preserve potency, and deliver visible results. The outcome is a stable, water-based formulation that offers superior efficacy in reducing hyperpigmentation, evening skin tone, and supporting overall skin health by reducing reactive oxygen species.

What is Hyperpigmentation?

Hyperpigmentation is a **common skin condition** where certain areas of the skin become **darker than the surrounding areas**.

Hyperpigmentation is caused by excess or uneven melanin production in the skin and arises from a combination of environmental and biological factors. The most common trigger is sun exposure, where UV and HEV light stimulate melanocyte activity through oxidative stress and signalling pathways that respond by increasing melanin synthesis.



Inflammation from **acne**, **eczema**, or **skin injury** can lead to post-inflammatory hyperpigmentation (**PIH**). The skin heals by producing excess melanin at the site of inflammation, leading to dark spots that can last long after the initial lesion resolves. Hormonal changes such as those during pregnancy or from taking oral contraceptives, can cause **melasma** by increasing melanocyte response to UV light. Genetic predisposition and darker skin types are generally more prone to hyperpigmentation due to naturally higher melanocyte activity.

Mechanism of Hyperpigmentation

Hyperpigmentation occurs through a well-defined biological mechanism involving **melanin production**. Here's a breakdown of how it works:

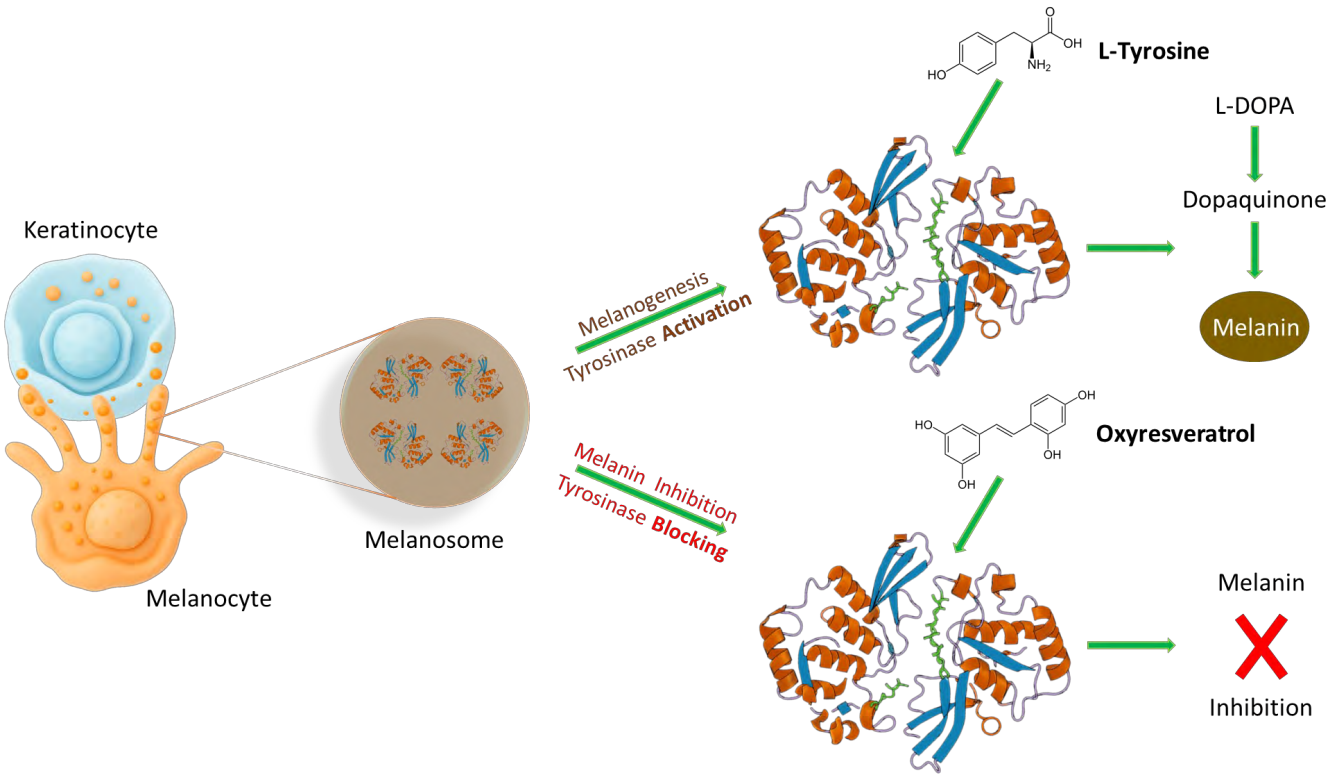
Triggering Stimulus: External factors like UV radiation, skin injury, inflammation, or hormonal changes stimulate the skin. These stimuli activate **melanocytes**, the pigment-producing cells located in the basal layer of the epidermis.

Melanin Synthesis: Melanocytes produce **melanin** inside organelles called **melanosomes**. The key enzyme is **tyrosinase**, which converts the amino acid **tyrosine** via L-DOPA and then dopaquinone into melanin.

Melanosome Transfer: Melanosomes are transferred from melanocytes to **keratinocytes**, the predominant cells in the epidermis. This transfer causes visible darkening of the skin as melanin accumulates in the upper layers of the skin.

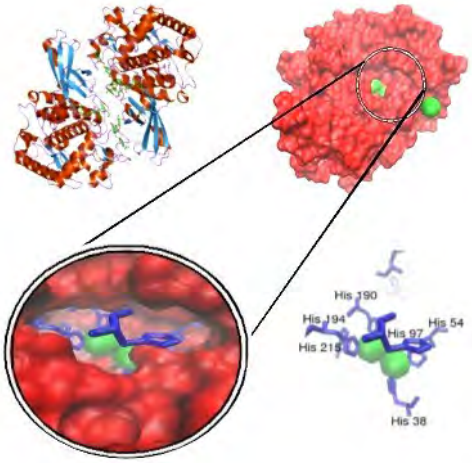
Pigment Accumulation: **Epidermal** pigmentation appears more superficial and responds better to treatment.
Dermal pigmentation is deeper and more resistant to topical therapies.

Persistence or Resolution: If the stimulus persists (e.g., chronic sun exposure or ongoing inflammation), pigmentation remains or worsens. If the stimulus is removed, melanin production may normalize, but residual pigment can linger for months or years.



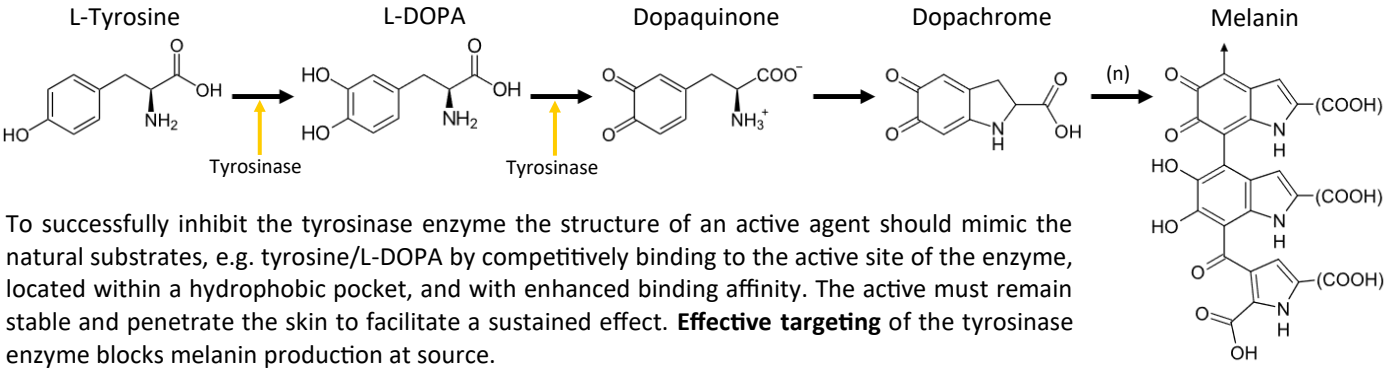
How can hyperpigmentation be supressed?

A wide range of methods and active ingredients have been developed to target hyperpigmentation through multiple biological pathways. These include inhibiting melanin synthesis, reducing melanosome transport, accelerating melanin metabolism and degradation, enhancing skin renewal, and offering anti-inflammatory and UV-protective interventions. Among these, tyrosinase—a key enzyme in the melanin synthesis pathway—has emerged as one of the most commonly targeted mechanisms, with its inhibition playing a central role in many treatment strategies.



Targeting the Tyrosinase Pathway: Tyrosinase is a copper-containing enzyme, and it is mostly known for its role in the production of melanin pigments (melanogenesis) in skin, eyes and hair. The catalytic action of tyrosine presents the rate-limiting step in the production of melanin pigments .

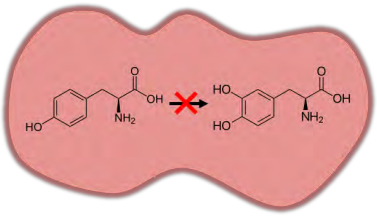
The enzyme acts by catalysing hydroxylation of tyrosine to L-DOPA (**monophenolase activity**) and subsequent oxidation of L-DOPA to dopaquinone (**diphenolase activity**). Dopaquinone is then nonenzymatically converted to dopachrome, which is acted upon by an isomerase to form dihydroxyindoles. Further cyclization, oxidation and polymerization produce melanin.

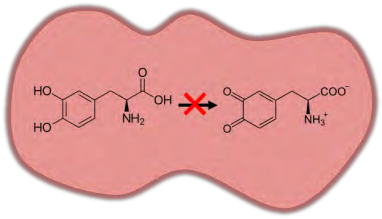


To successfully inhibit the tyrosinase enzyme the structure of an active agent should mimic the natural substrates, e.g. tyrosine/L-DOPA by competitively binding to the active site of the enzyme, located within a hydrophobic pocket, and with enhanced binding affinity. The active must remain stable and penetrate the skin to facilitate a sustained effect. **Effective targeting** of the tyrosinase enzyme blocks melanin production at source.

Targeting both **monophenolase** and **diphenolase** activities of tyrosinase is crucial for effectively suppressing melanogenesis.

Monophenolase inhibition prevents the initiation of melanogenesis. Without conversion of tyrosine to L-DOPA, the pathway can't begin.





Diphenolase inhibition halts the progression of the pathway. Even if residual L-DOPA is present (incomplete monophenolase inhibition), it can't be converted into dopaquinone — the precursor to melanin.

If only one activity is inhibited the other can still function, allowing partial melanin synthesis to proceed. This leads to incomplete depigmentation, which is judged to be ineffective for medical or cosmetic outcomes. By targeting both enzyme activities, maximum suppression of melanin production can be achieved. This is especially important for treating hyperpigmentation disorders like melasma, age spots, or post-inflammatory hyperpigmentation.

The choice and potency of compounds acting on tyrosinase has been limited for the cosmetic formulator. Conventionally used inhibitors do not come without restrictions or concerns for customer safety:

Hydroquinone:	**Banned or restricted** in several countries due to safety concerns
	Can cause **irritation**, **redness**, and **contact dermatitis**
	Long-term use linked to **ochronosis** (bluish-black discoloration)
Arbutin:	**Less potent** than hydroquinone
	May convert to **hydroquinone** in vivo, raising similar **safety concerns**
Kojic Acid:	May cause skin **sensitivity** and **allergic reactions**
	Stability issues in formulations (can degrade over time)

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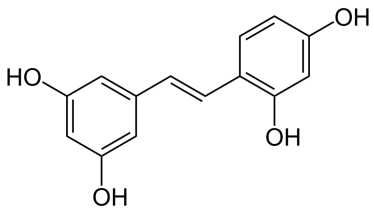
Multiple mechanisms of action:
Directly inhibits tyrosinase (in vitro models).
Scavenges oxidative stress, a stimulant of pigmentation.
Suppresses MITF signalling, lowers melanin enzyme expression.
Inhibits melanosome transfer, reducing pigment dispersion.
Demonstrates **clinical benefit in melasma** with excellent safety.
Stable, encapsulated in **Lipodisq®** for superior performance.

Oxyresveratrol (also known as Hydroxyresveratrol) is a naturally occurring polyphenolic compound, structurally related to resveratrol. It exhibits potent skin depigmenting effects by targeting tyrosinase inhibition, whilst delivering anti-oxidant and anti-inflammatory actions. Although highly active, use of oxyresveratrol in personal care formulations has been limited due to its **instability** and its intensely **hydrophobic** character.



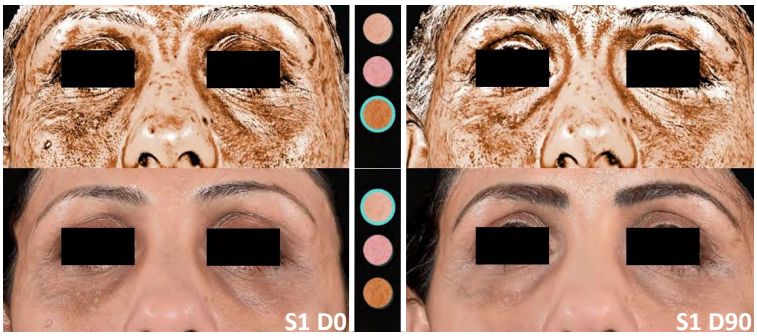
Potent Tyrosinase Inhibition: Superior performance vs Kojic acid at inhibiting Tyrosinase's dual catalytic function. When L-Tyrosine is the substrate of mushroom tyrosinase, oxyresveratrol acts as a reversible mixed-type inhibitor (110 x potency vs Kojic acid—Monophenolase activity)[1-4, 7-10]. When L-DOPA is used as the substrate, oxyresveratrol inhibits the enzyme in a non-competitive manner (52 x potency vs Kojic acid—Diphenolase activity)[1,2,5-7,9-12]. Lipodisq® Oxyresveratrol outperforms conventional alternative skin brightening agents, *Pterocarpus Marsupium* extract and *Curcuma Longa* extract.

Inhibitor	Enzyme Function	Substrate	Mean IC_{50} µM
Oxyresveratrol	Monophenolase	L-Tyrosine	1.38
Kojic acid	Monophenolase	L-Tyrosine	152.30
Oxyresveratrol	Diphenolase	L-DOPA	10.30
Kojic acid	Diphenolase	L-DOPA	539.20

Test Compound	Tyrosinase Inhibition	Anti-oxidant Activity (SOD)	Hyaluronidase Inhibition
Lipodisq® Oxyresveratrol PE Solution	76.1%	100%	95.6%
Extract of Pterocarpus Marsupium	19.3%	68.3%	70.8%
Extract of Curcuma Longa	17.5%	10.4%	45.0%

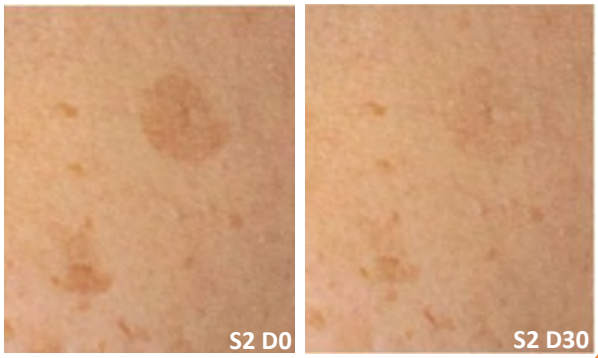
Antioxidant Activity (SOD Assay): Lipodisq® Oxyresveratrol scavenges reactive oxygen species (ROS) that stimulate melanogenesis. ROS can activate MITF (microphthalmia-associated transcription factor), which upregulates tyrosinase expression. By neutralizing oxidative stress, Lipodisq® Oxyresveratrol can reduce UV-induced melanogenesis.

Hyaluronidase Inhibition: When hyaluronic acid is degraded, the skin becomes more vulnerable to inflammation, oxidative stress, and UV damage — all of which can trigger or worsen hyperpigmentation. Inflammatory skin conditions often lead to post-inflammatory hyperpigmentation (PIH), especially in darker skin tones. Lipodisq® Oxyresveratrol successfully inhibits Hyaluronidase activity.

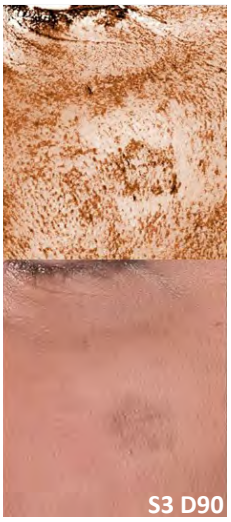


In vivo efficacy: Large Area Skin Brightening "Panda Eyes" **Subject 1:** (Asian skin type). Lipodisq® Oxyresveratrol formulated into cosmetic aqueous based serum at 12.5% [0.35% Oxyresveratrol] applied to under eye and nose, once daily at night, post cleansing. After 90 days significant depigmentation is visible under eyes and conclusive reduction in freckled hyperpigmentation across the nose.

In vivo efficacy: Large Area Skin Brightening "Blemish Control" **Subject 2:** (South-East Asian skin type). Lipodisq® Oxyresveratrol formulated into cosmetic aqueous based serum at 12.5% [0.35% Oxyresveratrol] applied to cheeks and forehead, once daily at night, post cleansing. After only 30 days significant reduction reported in pigmentation intensity across large areas of facial blemishes.

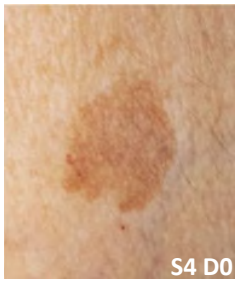


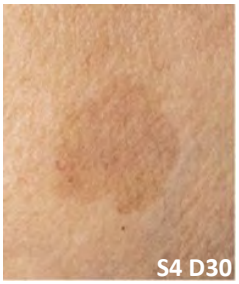
In vivo efficacy: Target Spot/Zone Application. Lipodisq® Oxyresveratrol formulated into cosmetic aqueous based serum at 12.5% [0.35% Oxyresveratrol] applied to target zone twice daily, post cleansing.



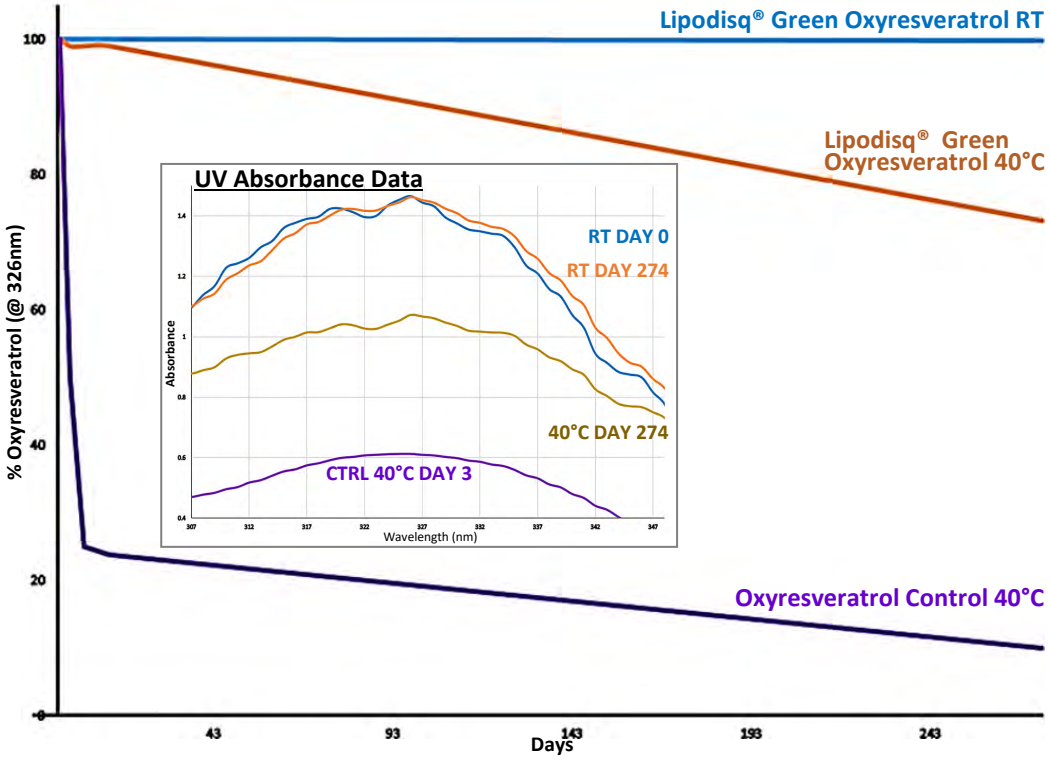
Subject 3: (Asian skin type) Hyperpigmentation zone under eye/cheek area. Previous laser treatment to area did not disrupt primary melanin cluster (reducing surrounding pigmentation only). After 90 days of use, Lipodisq® Oxyresveratrol has significantly reduced melanin cluster intensity.

Subject 4: (South-East Asian skin type) Hyperpigmentation zone on lower arm. After only 30 days of use, colour intensity of hyperpigmentation zone markedly reduced.

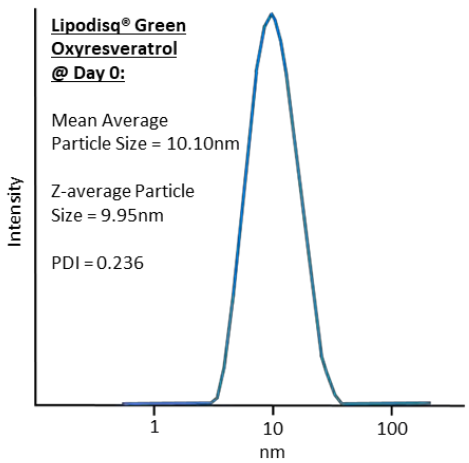


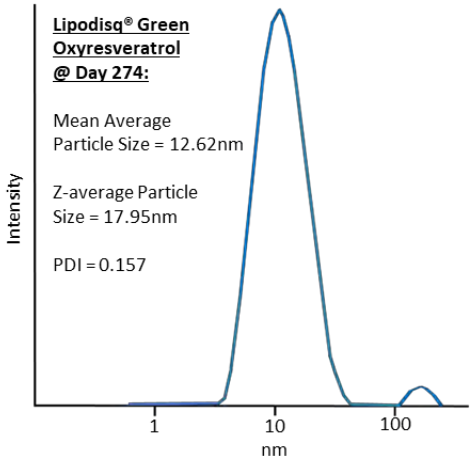


Superior Stability: A key limitation of oxyresveratrol lies in its inherent instability, stemming from its stilbene backbone, which is highly sensitive to oxygen and moisture. Without sophisticated packaging or stabilizing agents, its potency may degrade within days of formulating—potentially driving up formulation costs and impacting consumer acceptability. Encapsulating oxyresveratrol in nanosized lipid-based particles, Lipodisq®, shields it from environmental stressors, dramatically extending its shelf life and preserving activity and potency.



Lipodisq® technology demonstrates exceptional stability in protecting oxyresveratrol over time. After more than 270 days of storage at room temperature (RT), 99.79% of the active ingredient remained intact, as measured by UV-Vis spectrophotometry at λ 326 nm. Even under accelerated ageing conditions at 40°C, the formulation retained 73.17% of its oxyresveratrol content—significantly outperforming conventional control emulsions (CTRL), which showed rapid degradation: only 50.00% remained after 3 days, 25.00% after 7 days, and less than 10.00% by day 274.



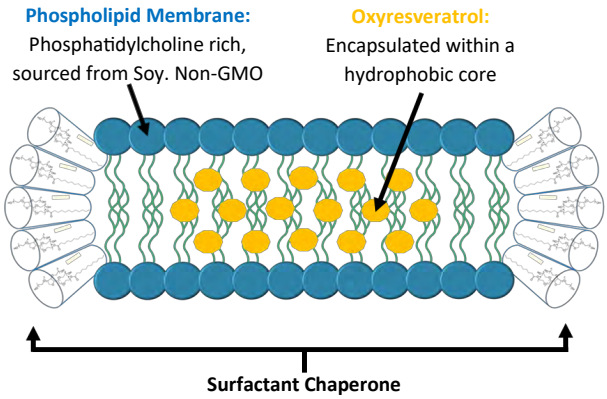


Importantly, Lipodisq® particles maintained a consistent size distribution throughout, ensuring reliable delivery and formulation integrity.

Encapsulation within Lipodisq® renders oxyresveratrol water soluble, enhances stability, increases topical penetration and increases the potential scope of final formula presentations. Lipodisq® Oxyresveratrol Solutions are available in two formats for use in the personal care industry. Our most versatile **Standard Grade** solution is composed of a nano-structure, assembled from Soy Phospholipids (non-GMO) and Polysorbate 20 (RSPO, MBAL). Our **Green Grade** solution is Polysorbate and Phenoxyethanol free, utilising Sucrose Ester surfactants of natural origin, enhancing Biodegradability and Naturality profile.

Product	INCI	Key Features/Functions
Lipodisq® Oxyresveratrol PE Solution	Aqua, Polysorbate 20, Dipotassium Glycyrrhizate, Lecithin, Oxyresveratrol, Phenoxyethanol, Ethylhexylglycerin	Skin brightening/lightening properties via inhibition of tyrosinase (dual activity). Potent anti-oxidant for ROS scavenging, anti-ageing, skin soothing and anti-inflammatory activity.
Lipodisq® Green Oxyresveratrol Solution	Aqua, Sucrose ester, Dipotassium Glycyrrhizate, Lecithin, Oxyresveratrol, Pentylene glycol, Caprylyl glycol, Bioflavonoids	Polysorbate 20 and Phenoxyethanol free. Skin brightening/lightening properties via inhibition of tyrosinase (dual activity). Potent anti-oxidant for ROS scavenging, anti-ageing, skin soothing and anti-inflammatory activity. 97.2% Natural Origin

Lipodisq® technology represents a significant leap forward in skincare science. Inspired by the structure of naturally occurring High Density Lipoprotein (HDL) endogenous to the human body, Lipodisq® are biodegradable, self-assembling, stable, low energy nano-structures, 10-40nm in size. Composed of naturally sourced phospholipid (Soy, Non-GMO) in the form of a phospholipid bilayer, stabilised by conventional surfactant / bio-surfactant structures, Lipodisq® technology is able to solubilise hydrophobic / lipophilic and amphiphilic active agents, including oxyresveratrol.



Standard Grade: Polysorbate 20, RSPO, MBAL
Green Grade: Sucrose Ester, Natural Origin & Enhanced Biodegradability

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