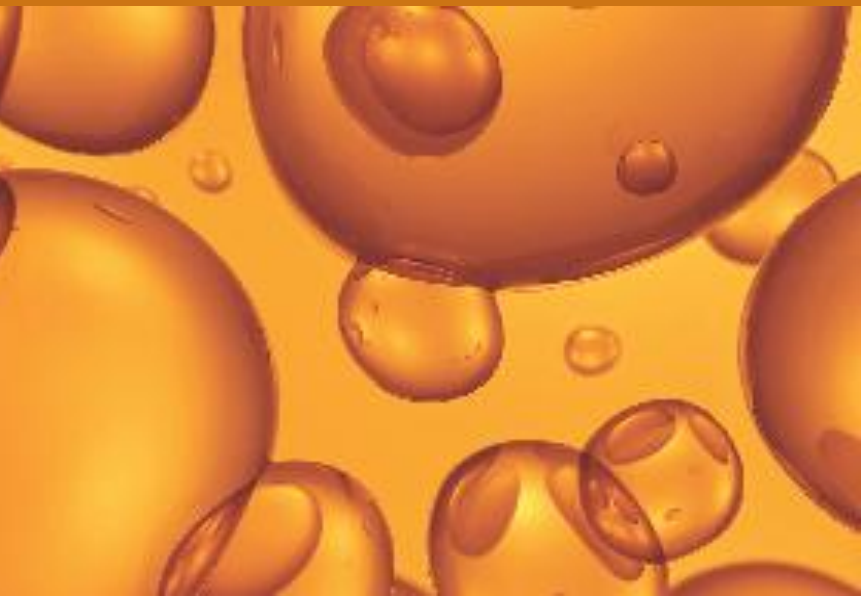


Vitamins

*The non-negotiable foundation of
skin longevity*



Vitamins at dsm-firmenich

Setting the global standard for essentials



For more than 80 years, **dsm-firmenich** has been a **global reference in Vitamins**, combining **unmatched portfolio breadth**, **scientific depth** and **industry-leading quality standards**.

We support all 13 Vitamins with full safety data, regulatory dossiers and global certifications — serving **personal care, nutrition** and **health applications** at scale.

Our Vitamins are designed, manufactured and supplied under **rigorous, industry-leading quality** and **safety frameworks, full traceability** and **stringent regulatory control**, with **EU-based production** as well as **global supply reliability**.

Beyond ingredients, our expertise spans **biological science, formulation know-how** and **sustainability leadership**, enabling brands to build performance on foundations they can trust, supported by **ongoing scientific discovery** and **deep expertise**.

Why the obvious is the next big thing

Vitamins, the healthy foundations of skin longevity

- **Science-backed well aging essentials**
- **Trusted** for their **safety, biological relevance & strong clinical evidence**

In the race for new longevity actives, Vitamins risk being overlooked yet they play a **critical role in key aging pathways**.

Reframing Vitamins as **targeted skin longevity cofactors**, highlights a simple truth:

Healthy aging starts with essentials.



Modulating the hallmarks of aging

Vitamins as the skin non-negotiables

Modern research connects Vitamins directly to **core hallmarks of ageing** and related pathways.

Vitamins are more than general antioxidants; They **act as precision cofactors of skin longevity**, plugging into cellular machinery at defined biological points.

As each Vitamin can influence multiple pathways, **Vitamin-based skincare** is a powerful strategy to **simultaneously address various underlying causes of visible skin aging**.

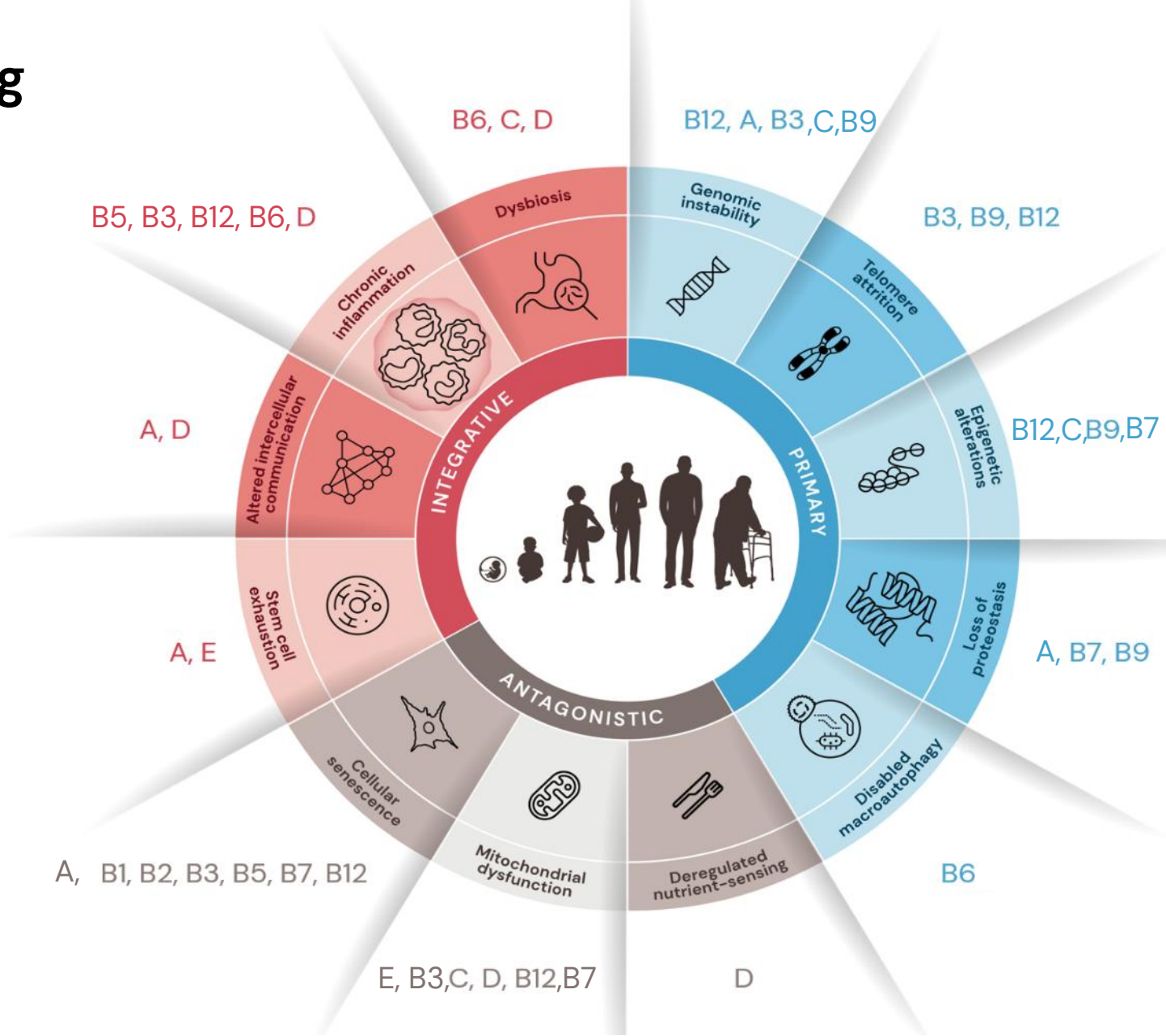


Figure 1: Modified from Personal Care Magazine article "Vitamins: modulating the hallmarks of skin ageing" B. Brockway, M. Gempeler, D. Imfeld

The hallmarks of aging

Simplified summary

Genomic instability → DNA damage accumulates sort of “typos” in the instruction manual, leading cells to function less accurately over time

Telomere attrition → Protective DNA end-caps shorten with each cell division, limiting renewal and accelerating aging

Epigenetic alterations → The genetic control panel loses precision, cells are *misprogrammed* (e.g. they execute stress/aging instead of renewal)

Loss of proteostasis → Cells struggle to make, fold, and recycle proteins correctly, weakening structure and resilience

Disabled macroautophagy → Cellular “clean-up” slows down, allowing damaged components to accumulate

Deregulated nutrient sensing → Cells misread nutrient & energy availability, disturbing growth, repair, & longevity pathways.

Mitochondrial dysfunction → Energy production declines and cellular stress increases, reducing vitality and repair capacity

Cellular senescence → Aged cells stop dividing but don’t disappear (zombie cells). They clutter the cellular space & jeopardize skin vitality

Stem cell exhaustion → The skin’s regenerative cell pool shrinks, slowing renewal and repair over time

Altered intercellular communication → Cells communicate less effectively, increasing inflammation and reducing coordinated repair

Chronic inflammation (inflammaging) → Persistent low-grade inflammation damages tissue structure and accelerates aging

Dysbiosis → Imbalances in the skin microbiome impair barrier function, immunity, and skin homeostasis.

Simplification of cellular and molecular hallmarks system proposed by López-Otín C et al. Hallmarks of aging: An expanding universe. Cell. 2023; 186(2): 243–278

Vitamin C (Ascorbic Acid)

The skin longevity “non-negotiable foundation”

ALREADY WELL KNOWN FOR:

- Supporting Collagen synthesis, and strengthening Collagen quality as co-factor for enzymes that stabilize and cross-link Collagen fibers*
- Brightening skin tone, by inhibiting tyrosinase to reduce hyperpigmentation
- Neutralizing reactive oxygen species (ROS)

WHY IT MATTERS FOR SKIN LONGEVITY?

*A cornerstone of long-term healthy-looking skin,
helping maintain skin’s structural resilience & repair capacity over time*

Longevity Science

- Epigenetic regulator, switches-on DNA repair pathways and helps counteract age-related inefficiencies**

Longevity takeaway

A key longevity vitamin, preserving DNA stability & repair capacity over time.

* Boyera et al. International Journal of Cosmetic Science. 1998; 20(3), 151–158

** Pavlovic et al. Open Medicine. 2023; 18(1);

Brabson, J. P., Leesang, T., Mohammad, S., & Cimmino, L. Epigenetic regulation of genomic stability by vitamin C. Frontiers in Genetics (2021.)

Hallmarks highest fit:

- Epigenetic alterations
- Genomic instability

Vitamin B5 (Panthenol)

The “daily guardian” of skin resilience

ALREADY WELL KNOWN FOR:

- Supporting skin natural repair process & strengthens the barrier renewal by fueling coenzyme A–dependent lipid synthesis, essential for long-term resilience
- Moisturizing & soothing the skin

WHY IT MATTERS FOR SKIN LONGEVITY?

Supports long term skin resilience

Longevity Science

- Reduces inflammatory pressure and can prevent senescence
- Supports high-demand repair under environmental stressors (e.g. UV, pollution)

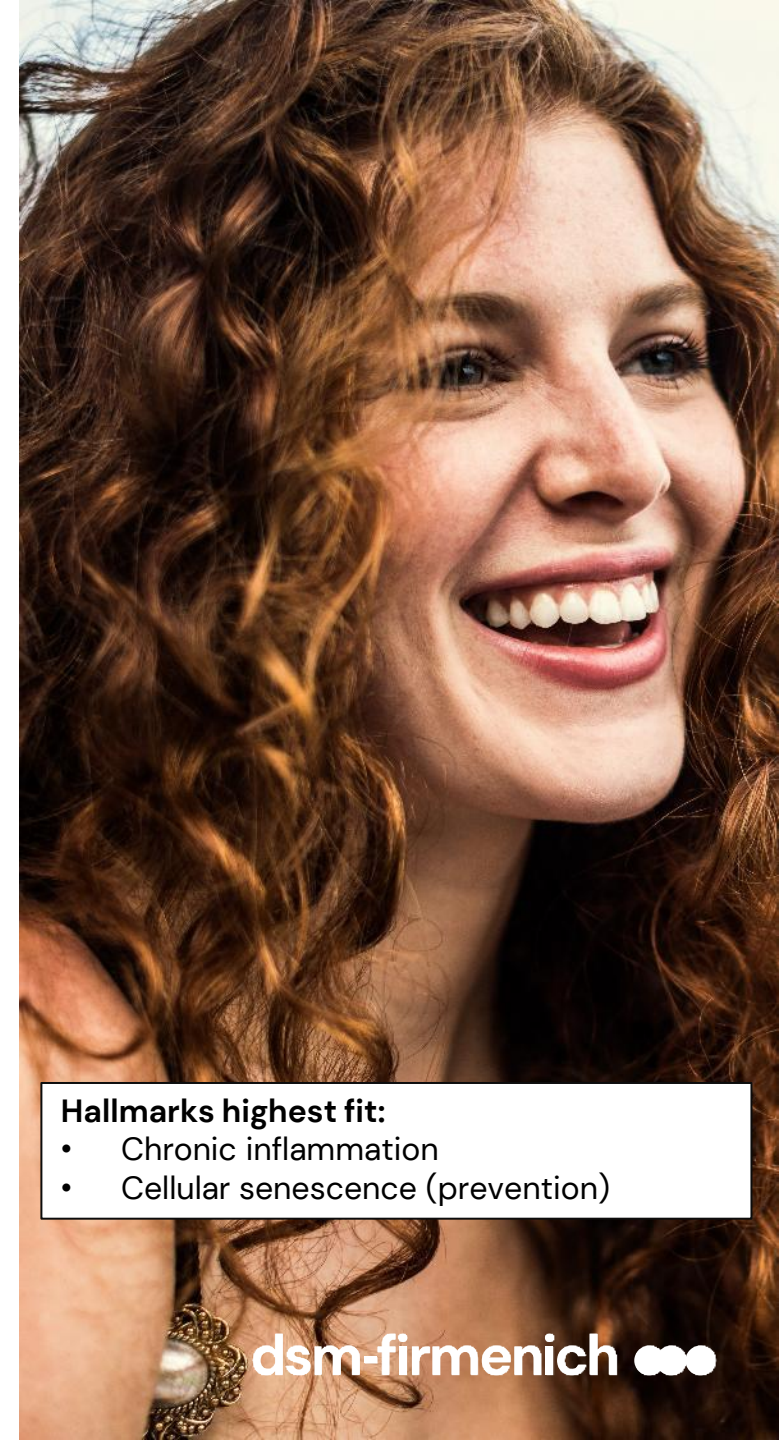
Longevity takeaway

The daily guardian of skin resilience, by preserving barrier, as well as supporting skin’s anti-inflammatory capacity*.

* Ebner et al. American Journal of Clinical Dermatology. 2002; 3(6), 427–433.

Hallmarks highest fit:

- Chronic inflammation
- Cellular senescence (prevention)



Vitamin B3 (Niacinamide)

The skin “cellular rehab”

ALREADY WELL KNOWN FOR:

- Strengthening the skin barrier, as cofactor in Ceramides synthesis
- Reducing uneven tone and improving fine lines

WHY IT MATTERS FOR SKIN LONGEVITY?

*A multitasking Vitamin that helps restore cellular energy and repair pathways, helping skin to perform at its best over time**

Longevity Science

- NAD⁺ precursor, Niacinamide activates Sirtuin pathways that support Mitochondrial energy, DNA repair & Telomeres stability for lifelong performance
- By calming low-grade inflammation, Niacinamide helps protect Collagen & Elastin, preserving skin structure over time

Longevity takeaway

All-in-one cellular rehab.

NAD⁺ booster & energy cofactor supporting DNA repair, anti-inflammatory balance and long-term skin resilience.

Hallmarks highest fit:

- Mitochondrial dysfunction
- Genomic instability
- Telomere attrition
- Chronic inflammation
- Senescence (prevention)



Vitamin B12 (Cobalamin)

The skin “gene-regulation supporter”

ALREADY WELL KNOWN FOR:

- Supporting skin vitality by facilitating oxygen & essential nutrients supply
- Contributing to healthy skin-nerve communication*
- Reducing oxidative stress & chronic inflammation

WHY IT MATTERS FOR SKIN LONGEVITY?

Help keep skin cells stable, energized & resilient over time.

Longevity Science

- It's essential for DNA synthesis & methylation (chemical “on/off switch”)**
- Through methylation, it restores epigenetic shift and regulates gene expression
- Protects DNA & contributes to genomic stability
- It can prevent senescence, mitochondrial damage & telomere shortening***

Longevity takeaway

Supports cellular energy metabolism, DNA integrity and gene regulation, helping skin cells stay stable, functional, and youthful over time.

Hallmarks highest fit:

- Genomic instability
- Epigenetic alterations
- Chronic inflammation
- Senescence (prevention)
- Telomere attrition (prevention)
- Mitochondrial dysfunction (prevention)

* Calderón et al. CNS Neuroscience & Therapeutics. 2020; 26(1), 5–13

** Froese et al. Journal of Inherited Metabolic Disease. 2019; 42(4), 673–685

***Simonenko et al. Int. J. Molecular Sciences. 2024, 25, 5044



Vitamin B6 (Pyridoxine)

The skin proteins “quality-controller”

ALREADY WELL KNOWN FOR:

- Supporting amino acid metabolism
- Contributing to immune function
- Supports proper Collagen cross links*

WHY IT MATTERS FOR SKIN LONGEVITY?

Helps maintain protein quality & immune function as skin ages

Longevity Science

- Limits formation of advanced glycation that impair tissues biomechanics**
- It had been shown to regulate cellular cleaning by autophagy***
- Helps control chronic low-grade inflammation linked to ageing****

Longevity takeaway

Contributes to supple, resilient skin by preserving protein integrity and immune equilibrium, potent anti-inflammatory effects.

* Inubushi et al. BioFactors. 2005; 23, 59–67

** Ramis et al. Antioxidants. 2019; 8(344)

***Zhang et al. metabolites. 2022; 12, 1048

*** Mikkelsen et al. Biomedicines. 2023 (11) 2578

Hallmarks highest fit:

- Disabled macro-autophagy
- Chronic inflammation

Vitamin B9 (Folic Acid)

The skin cell “DNA–renewal cofactor”

ALREADY WELL KNOWN FOR:

- Supporting cell division

WHY IT MATTERS FOR SKIN LONGEVITY?

Essential for maintaining DNA integrity in a high turnover tissue like skin.

Longevity Science

- Supports DNA synthesis, repair & methylation*
- Cofactor in protein methylation to maintain proteostasis
- Protects against UV induced genomic instability**
- Helps maintain telomere and epigenetic stability***

Longevity takeaway

Critical for preserving long-term genetic stability, epigenetic regulation for skin that functions properly over time.

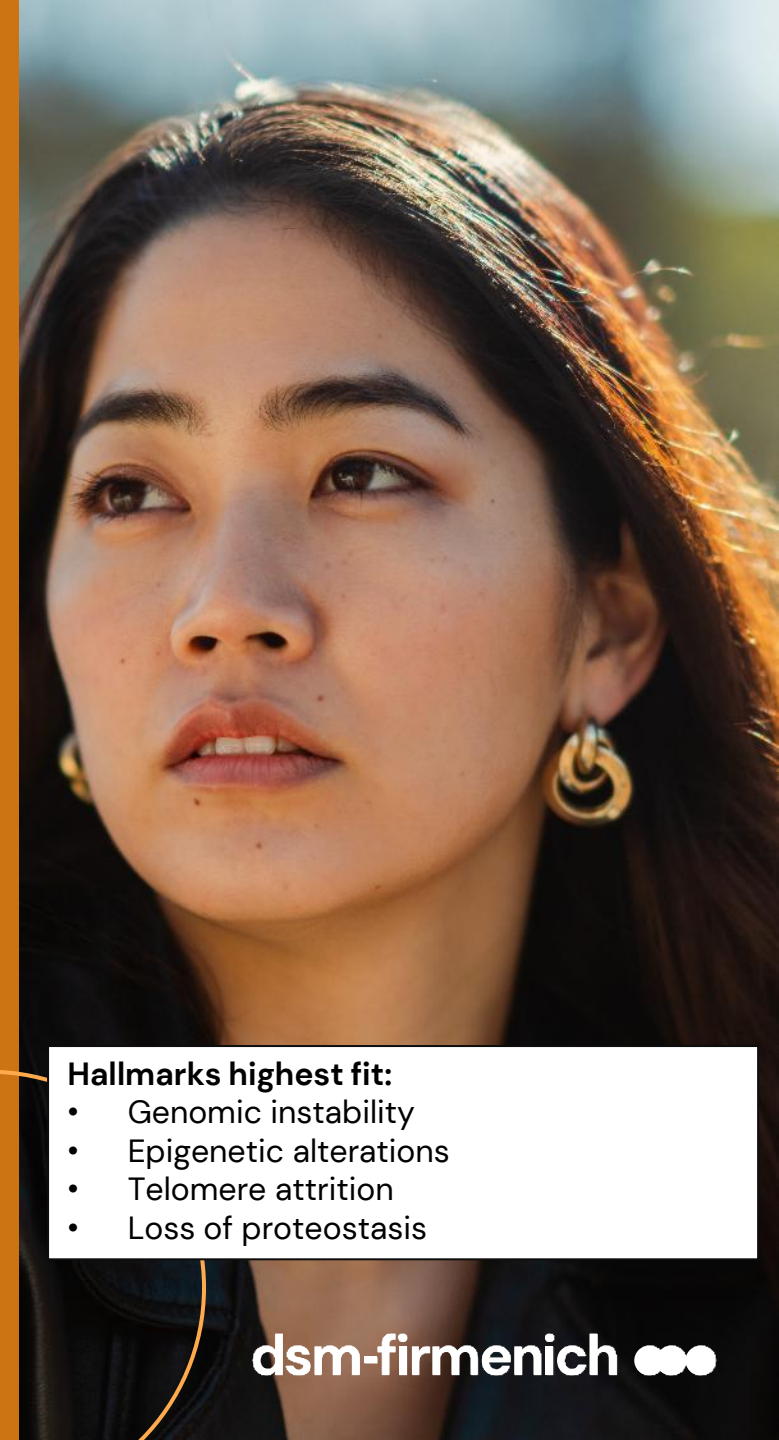
Hallmarks highest fit:

- Genomic instability
- Epigenetic alterations
- Telomere attrition
- Loss of proteostasis

* Crider et al. Advances in Nutrition. 2012; 3(1), 21–38

** Jurzak et al. Pharmaceuticals. 2025; 18(10), 1497

*** Moores et al. Ann. N.Y. Acad. Sci. 1229 (2011) 76–88



Vitamin A (Retinol)

The skin longevity “re-programmer”

ALREADY WELL KNOWN FOR:

- Improving wrinkles and uneven tone
- Accelerating epidermal turnover

WHY IT MATTERS FOR SKIN LONGEVITY?

A cornerstone of long-term skin renewal

Longevity Science

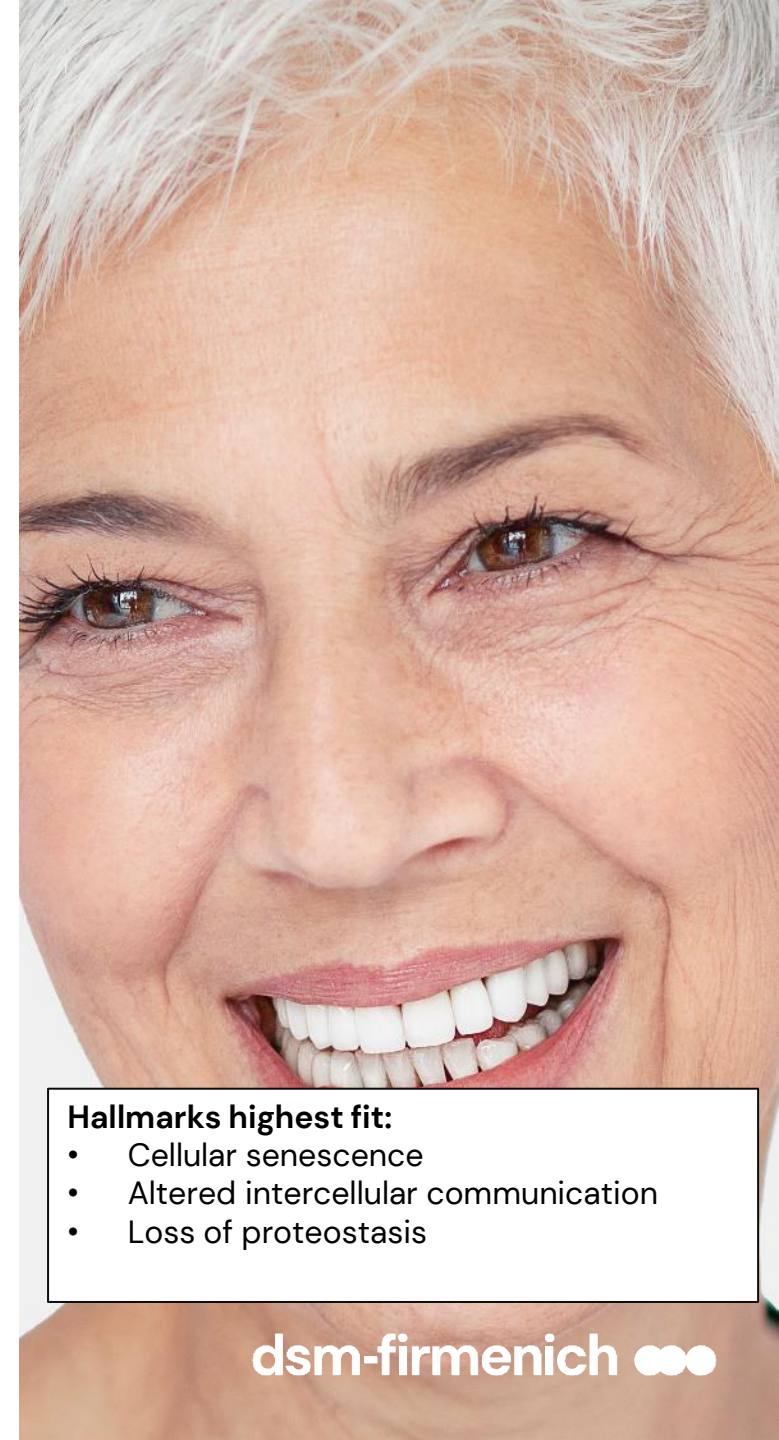
- Limits cellular senescence, by resetting age-altered cell behavior through RAR/RXR (nuclear receptors)-mediated gene programs*
- Supports Collagen, Elastin and Fibronectin synthesis while limiting ECM-degrading enzymes, helping prevent dermal structural decline
- Counteracts impaired cellular communication, by improving signaling & reducing senescence-associated dysfunctions that can disrupt coordinated skin renewal**

Longevity takeaway

Supports lifelong skin health span by resetting age-altered cell behavior and maintaining dermal tissue integrity over time.

Hallmarks highest fit:

- Cellular senescence
- Altered intercellular communication
- Loss of proteostasis



Vitamin B7 (Biotin)

The “metabolic and epigenetic balance-keeper”

ALREADY WELL KNOWN FOR:

- Biotin acts as a cofactor for key enzymes, helping skin cells convert nutrients into energy and essential lipids, supporting healthy-looking skin, hair and nails

WHY IT MATTERS FOR SKIN LONGEVITY?

Helps skin cells stay energized and keeps gene activity properly regulated over time

Longevity Science

- Epigenetic control via biotinylation of histones and gene regulation*
- Helps maintain mitochondrial function and metabolism**

Longevity takeaway

Preserves metabolic and mitochondrial function and acts as epigenetic modulator

* Karachaliou et al. Int. J. Mol. Sci. 2024, 25, 6578

**Lohr et al. PNAS, 2020; 117(52), 33608–33618

** Madsen et al. nature communications. 2015, 6, 7726

Hallmarks highest fit:

- Epigenetic alterations
- Mitochondrial dysfunction

Vitamin D (Calciferol)

The skin longevity “immune orchestrator”

ALREADY WELL KNOWN FOR:

- Supporting calcium metabolism
- Contributing to immune defense

WHY IT MATTERS FOR SKIN LONGEVITY?

By orchestrating immune & inflammatory response, and supporting cellular protection mechanisms, Vitamin D helps sustain skin homeostasis over time

Longevity Science

- Enhances mitochondrial protection
- Protects against inflammaging
- Supports DNA repair and photoprotection mechanisms*

Longevity takeaway

Supports long-term skin health by controlling inflammaging and preserving coordinated immune, as well as repair responses.

Bocheva et al. International Journal of Molecular Sciences. 2021; 22(16), 9097.

Vitamin D is not authorized for cosmetic use in the EU or in major LATAM markets, including Brazil, Mexico, the Andean Community Countries, and Argentina. Any references are provided for scientific context only and do not imply cosmetic use or commercialization in those Countries

Hallmarks highest fit:

- Mitochondrial dysfunction
- Chronic inflammation

Vitamin E (Tocopherol)

The skin longevity “membrane protector”

ALREADY WELL KNOWN FOR:

- Protecting lipids from oxidation
- Limiting Collagen degradation under UV stress, supporting skin smoothness

WHY IT MATTERS FOR SKIN LONGEVITY?

*Acts at the membrane level — where oxidative damage initiates cellular decline**

Longevity Science

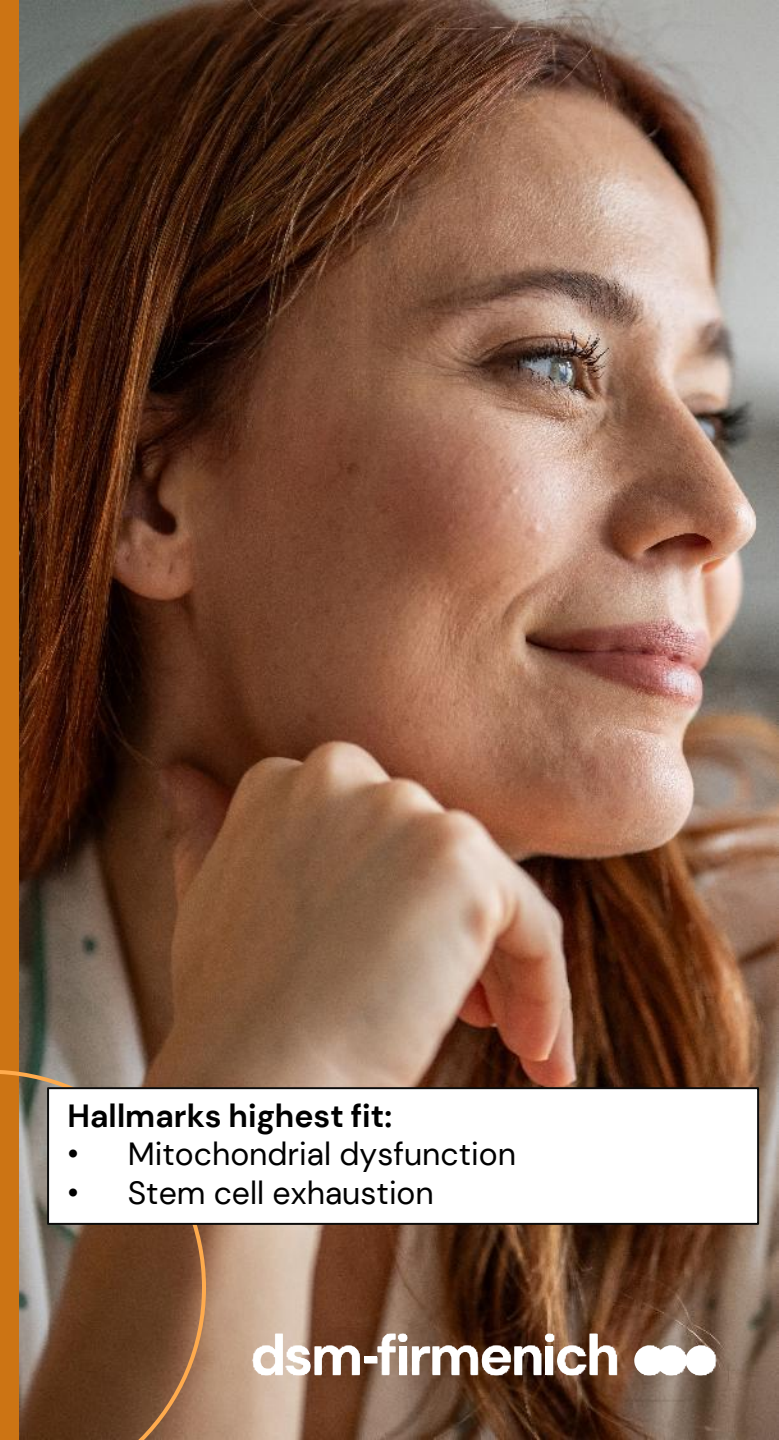
- Stabilizes mitochondrial membranes, limiting lipid peroxidation and toxic by-product formation, helping cells maintain repair functions over time
- Breaks ROS amplification loops that impair energy production

Longevity takeaway

Protects skin’s structural and barrier systems against long term oxidative wear.

Hallmarks highest fit:

- Mitochondrial dysfunction
- Stem cell exhaustion



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