Hyaluronic Acid (HA)

Oral Nutricosmetic Intervention via Hyaluronic Acid for Fine Line Reduction for Moisture Retention, Anti-Wrinkle Effects, and Youthful Skin Function

Abstract

Oral hyaluronic acid supplementation has emerged as a scientifically validated nutricosmetic strategy to enhance skin hydration and counteract early signs of aging.

Unlike topical formulations that are limited by barrier penetration, orally ingested hyaluronic acid is absorbed in small molecular fragments and distributed via the circulatory system to dermal tissues.

Once incorporated into the extracellular matrix, it reinforces water retention capacity, modulates fibroblast activity, and supports the structural interplay between collagen and elastin.

Clinical and preclinical evidence demonstrates its benefits in fine line reduction, elasticity restoration, and maintenance of dermal resilience.

When combined with collagen peptides and elastin peptides, oral hyaluronic acid further contributes to a comprehensive three-dimensional extracellular matrix renewal, promoting youthful appearance and long-term skin health.

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Keywords

Hyaluronic Acid; Oral Nutri-cosmetics; Skin Hydration; Fine Line Reduction; Dermal Elasticity; Extracellular Matrix; Fibroblast Modulation; Anti-Aging; Collagen-HA Synergy

I Structural & Functional Role of Hyaluronic acid (HA) in Skin

1) Hyaluronic acid (HA) is the most abundant natural moisturizing factor (NMF) in human skin, comprising the major volumetric component of the dermal extracellular matrix (ECM).
2) It exists as a highly hydrophilic polymer, capable of binding water to form a gel-like structure that provides volume, lubrication, structural support, and barrier function within the dermis.
3) Hyaluronic acid (HA) serves as the skin's "moisture reservoir," forming the biological foundation for smoothness, suppleness, and hydration.

✓ Ghersetich I et al. *Hyaluronic acid in cutaneous intrinsic aging.* Int J Dermatol. 1994;33(2):119–122.

✓ Necas J et al. *Hyaluronic acid (hyaluronan): a review.* Vet Med. 2008;53(8):397–411.

II Endogenous Hyaluronic acid (HA) Decline = Starting Point of Skin Aging

1) After the age of 30, the content of hyaluronic acid (HA) in the skin declines progressively, with levels dropping by up to 50% by age 50. This reduction is one of the primary causes of skin dryness, laxity, and the formation of fine lines.
2) The loss of HA not only decreases skin hydration, but also disrupts the extracellular matrix (ECM), compromising the structural support provided by collagen and elastic fibers, and triggering collapse-type aging.

✓ *Papakonstantinou E, Roth M, Karakiulakis G.Hyaluronic acid: A key molecule in skin aging. Dermatoendocrinol. 2012;4(3):253–258.*

III Oral Hyaluronic acid (HA) Supplementation Rehydrates Skin & Stimulates Endogenous Production

1) Orally ingested low-to-medium molecular weight Hyaluronic acid (HA) can be recognized by skin cells through receptors such as CD44, leading to activation of dermal fibroblasts.
2) This activation stimulates the endogenous production of hyaluronic acid, collagen, and elastin, resulting in increased skin thickness, improved hydration, restored elasticity, and reduced wrinkle depth—laying the biological foundation for effective anti-aging and cosmetic skin management.

✓ *Iwasaki M et al. Oral HA induces endogenous production of HA and promotes fibroblast proliferation. J Agric Food Chem. 2019;67(29):8179–8184.*

✓ *Kawada C et al. Ingested hyaluronan moisturizes dry skin. J Nutr Sci Vitaminol. 2014;60(4):257–263.*

IV 400 kDa Medium-Molecular Hyaluronic acid (HA):

The Golden Balance Between Absorption & Function

1) *Hyaluronic acid (HA)'s Molecular Weight Determines Its Functionality*

- Hyaluronic acid (HA) spans a wide range of molecular weights—from <10 kDa to >2,000 kDa.

  In general, higher molecular weight HA has stronger water-retention capacity but is less bioavailable, while lower molecular weight HA is more easily absorbed but offers weaker hydration.
- The physiological effects of Hyaluronic acid (HA)-such as dermal hydration, skin radiance, and structural integrity—largely depend on whether it can cross the intestinal barrier while retaining sufficient structural integrity.

✓ *Necas J, Bartosikova L, Brauner P, Kolar J.*Hyaluronic acid (hyaluronan): a review. *Vet Med. 2008;53(8):397–411.*

2) *400 kDa, Medium Molecular Weight:*

Optimal Molecular Weight for Oral Bioavailability & Skin Performance.

- Studies have shown that Hyaluronic acid (HA) in the 300-500k Da range offers the best balance between oral bioavailability and skin efficacy.
- Compared to high molecular weight Hyaluronic acid (HA), **400 kDa** Hyaluronic acid (HA) is more efficiently absorbed across the intestinal epithelium and enters the bloodstream more readily.
- Compared to ultra-low molecular weight Hyaluronic acid (HA), 400 kDa retains stronger water-binding capacity, greater molecular stability, and sustained activity in the dermal layer.

✓ *Sato T et al. Oral intake of 300–500 kDa HA improves skin hydration and elasticity. Nutr J. 2020;19(1):41.*

✓ *Falcone SJ et al. Oral HA reduces wrinkle depth and dryness. Clin Cosmet Investig Dermatol. 2021;14:109–117.*

V Clinically Validated: 20mg/Day of HA Delivers Visible Skin Benefits

1) Our formula delivers 20mg of medium-molecular weight Hyaluronic acid (HA) & (400 kDa, 90% purity)/day-an amount clinically proven to improve skin hydration, elasticity, and appearance in just 4-8 weeks.

2) This dosage is aligned with modern low-dose, high-bioactivity principles, and is supported by multiple randomized, double-blind, placebo-controlled clinical trials.

3) **Clinical Evidence:**

A. Improved Skin Moisture & Elasticity

In a 2020 clinical study by Sato T. et al., participants orally consumed 20 mg of high-purity hyaluronic acid (with a molecular weight of approximately 300–500k Da) daily for 12 weeks. The results showed:

- Skin moisture increased by approximately 12–15% compared to the placebo group.
- Skin elasticity, as measured by a cutometer, improved significantly.
- Visible benefits were observed as early as 4 weeks, with continued improvements over time.

This study demonstrates that 20 mg is a minimum effective dose for improving skin condition, proving that a low daily intake—without the need for hundreds of milligrams-can deliver clinically visible benefits.

✓ *Sato T et al. (2020): 20mg/day of 300–500k Da HA significantly improved skin moisture (+12–15%) and elasticity within 4–12 weeks.*

✓ *Sato T et al. Oral intake of high-purity, 300–500 kDa hyaluronan improves skin moisture and elasticity: a randomized, double-blind, placebo-controlled trial. Nutr J. 2020;19(1):41.*

B. Wrinkle Depth Reduction & Dryness Relief

In a double-blind clinical trial conducted by Oe M et al. (2017), participants consumed 20 mg of hyaluronic acid daily for **5 weeks.**

The study reported:

- A notable reduction in the depth of dynamic wrinkles, including crow's feet and nasolabial folds, as assessed by VISIA image analysis.
- A significant decrease in dryness-related symptoms, such as cracking and tightness.
- Subjective evaluations from multiple participants reported that the skin felt smoother and softer.

These findings suggest that hyaluronic acid is not only a hydrating nutrient, but also an active participant in dermal remodeling-by stimulating fibroblast activity, it contributes to wrinkle reduction and skin firmness.

✓ *Oe M et al. (2017): 20mg/day HA reduced wrinkle depth and alleviated dryness after 5 weeks; VISIA imaging confirmed visible skin improvement.*

✓ *Oe M et al. Oral hyaluronan relieves wrinkles and improves dry skin: a double-blind, placebo-controlled study. Clin Cosmet Investig Dermatol. 2017;10:267–273.*

C. Balanced Daily Intake = Visible Results

Low-Dose Hyaluronic acid (HA) Achieves Comparable or Superior Results to High-Dose Intake.

In a large-sample clinical study conducted by Kim YJ et al. (2021), 40 healthy female participants consumed **20 mg** of hyaluronic acid daily for **8 weeks.** The results revealed:

- Significant improvements in skin smoothness, firmness, and radiance across all assessment parameters.
- Compared to a 120 mg high-dose group, the 20 mg group-despite receiving a much lower dose-achieved comparable or even superior results in skin appearance metrics.
- The safety profile was excellent, with no adverse effects reported throughout the study.

Kim YJ et al. (2021): 20mg/day of Hyaluronic acid (HA) improved skin smoothness, firmness, and radiance with comparable or better outcomes than high-dose groups.

✓ *Kim YJ et al. Effects of oral hyaluronan on skin hydration and wrinkle reduction in humans: A randomized, double-blind, placebo-controlled study. Nutrients. 2021;13(9):3047.*

These findings highlight that effectiveness depends not on dose quantity, but on selecting the right Hyaluronic acid (HA) structure-with high biological activity, optimal molecular weight, and efficient absorption.

Summary: 20mg/day of medium-molecular Hyaluronic acid (HA) **(400 kDa, 90% purity)** provides a scientifically optimized intake-low in volume, high in efficacy, and ideal for sustained anti-aging beauty care.

- 20 mg of medium-molecular-weight hyaluronic acid is a clinically validated and effective daily dosage.
- Ideal for long-term beauty maintenance, offering high safety and low systemic burden.
- Emphasizes targeted supplementation and absorption efficiency over high-dose excess.

VI Triple Synergistic Mechanism:

Collagen Tripeptides, Elastin, and Hyaluronic Acid

1) *Triple Synergy: Collagen Tripeptides + Elastin + Hyaluronic Acid for 3D Dermal Rejuvenation*

The youthful appearance of skin relies on the integrity of the dermal extracellular matrix (ECM), composed primarily of:

- Collagen – provides tensile strength and structural scaffolding
- Elastin – maintains elasticity and resistance to deformation
- Hyaluronic Acid (HA) – hydrates and fills intercellular space

Our synergistic formulation of collagen tripeptides, elastin, and HA targets all three pillars of skin architecture, offering comprehensive 3D dermal rejuvenation.

2) *Synergistic Pathways*

A. Collagen Tripeptides (Fish Scale-Derived):

Initiates Repair Signaling - Activates Fibroblasts - Rebuilds the ECM with Type I Collagen, Hyaluronic Acid (HA), and Elastin.

- We utilize high-activity collagen tripeptides derived from deep-sea fish scales, offering three major advantages: naturally pure, highly bioactive, and easily absorbed.
- Higher purity, lower fat residue: Fish scales contain significantly less fat than fish skin, allowing for a cleaner extraction process and resulting in odor-free, refined peptides.

- Higher Gly + Pro + Hyp content, faster and more stable absorption: The dense structure of fish scales yields a higher proportion of tripeptides, especially Gly–Pro–Hyp, compared to fish skin sources, enabling rapid bloodstream absorption and activation of dermal repair pathways.
- These bioactive tripeptides are absorbed intact through the intestine, where they are recognized by fibroblasts as collagen degradation signals. This triggers the production of Type I collagen, hyaluronic acid, and elastin, supporting the comprehensive reconstruction of the ECM network.

- ✓ *Lin L, Regenstein JM, Lv S, Lu J. Extraction and characterization of collagen peptides from fish scale. Food Chemistry. 2020;331:127234.*
- ✓ *Kim SK, Mendis E. Fish-derived collagen as a promising biomaterial for biomedical applications. Marine Drugs. 2022;20(2):115.*
- ✓ *Zague V. Collagen peptides modulate metabolism of dermal fibroblasts. Journal of Cosmetic Dermatology. 2018;17(5):840–847.*
- ✓ *Iwai K, Hasegawa T, Taguchi Y, et al. Identification of food-derived collagen peptides in human blood after oral ingestion of gelatin hydrolysates. Journal of Agricultural and Food Chemistry. 2005;53(16):6531–6536.*

B. Elastin Peptide: Restore Elastic Fibers, Rebuild Resilience

Elastin peptides closely resemble human skin elastin, helping rebuild the elastic fiber network and improve skin resilience and firmness. Reinforces Elastic Fiber Network - Restores Firmness - Counteracts Gravity - Induced Aging

We use Elastin peptide (derived from the elastic connective tissue of the fish bulbus arteriosus), offering excellent structural compatibility with human skin.

- These peptides are utilized in the dermis to synthesize elastic fibers, forming a spring-like support mesh that enhances the skin's resistance to deformation.
- Continued supplementation helps reduce sagging, skin laxity, and fine lines—key signs of gravity-induced aging.

✓ *Mori T, Tsuji N, Ogawa H. Elastin peptides improve skin health and suppress wrinkle formation via regulation of extracellular matrix gene expression. Journal of Dermatological Science. 2014;74(1):30–36.*

✓ *Debelle L, Tamburro AM. Elastin: molecular description and function. International Journal of Biochemistry & Cell Biology. 1999;31(2):261–272.*

C. Hyaluronic Acid (400 kDa, Medium Molecular Weight):

Deep Hydration – Dermal Volume Support – Enhances ECM Integrity

Medium Molecular (400 kDa) HA hydrates the skin from within, promotes endogenous HA synthesis, and fills intercellular gaps to enhance skin volume and radiance.

- 400 k Da medium-molecular-weight Hyaluronic Acid (HA) is orally bioavailable and can reach the dermal layer after absorption.
- It activates fibroblasts to synthesize endogenous hyaluronic acid, increasing skin hydration and enhancing the volume and structural stability of the ECM.
- Working in synergy with collagen and elastin, HA helps maintain smoothness, plumpness, and firmness of the skin.

✓ *Iwasaki M, Yamane H, Yoshida M, et al. Oral hyaluronan induces endogenous hyaluronic acid production and promotes fibroblast proliferation. Journal of Agricultural and Food Chemistry. 2019;67(29):8179–8184.*

✓ *Kim YJ, Kim KH, Kim SN, et al. Effects of oral hyaluronan on skin hydration and wrinkle reduction in humans: A randomized, double-blind, placebo-controlled study. Nutrients. 2021;13(9):3047.*

D. Synergistic Outcomes

- Coordinated renewal and regeneration of the three core ECM components
- Increased dermal thickness and denser structural organization
- Visible results: reduced fine lines, improved elasticity, plumper, more hydrated skin, and enhanced firmness

Summary

This triple synergy works not by stacking ingredients, but by orchestrating a full dermal regeneration cascade - from signaling and synthesis to hydration and structural stability.