

GPX-4TM

**Science-Backed Collagen Tripeptides
Supporting Multi-System Health.**

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VINH
WELLNESS



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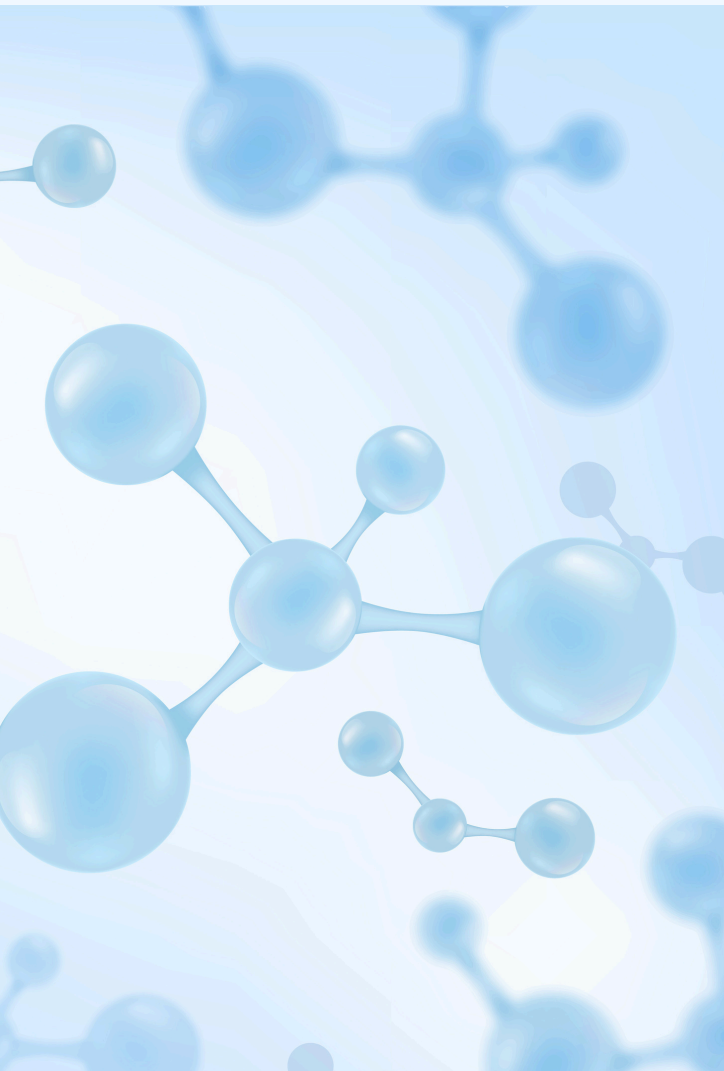
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The background of the page features a close-up, shallow depth-of-field shot of numerous white, oval-shaped pills scattered across a light blue surface. In the lower-left foreground, a single, large, translucent blue sphere is prominently displayed, partially overlapping the pills. The overall aesthetic is clean, clinical, and modern.

Summary

GPX-4™ is a next-generation collagen tripeptides ingredient derived from Pangasius skin, designed to support skin, joint & bone, and hair health. With >15% tripeptides, including 3% Gly-Pro-Hyp, it provides superior bioavailability, rapid clinical effects, and traceable sustainability. Multiple studies confirm its fast-acting benefits in skin hydration, joint pain relief and hair regeneration, making GPX-4™ an ideal active for premium beauty and wellness applications.

Introduction to Collagen Tripeptides



Collagen tripeptides are the functional units of collagen, consisting of three amino acids, most commonly Glycine-Proline-Hydroxyproline (Gly-Pro-Hyp). These bioactive peptides are produced through enzymatic hydrolysis of collagen and are highly absorbable through the intestinal barrier, reaching the bloodstream in their intact form. Once absorbed, they can accumulate in target tissues such as the skin, bones, joints, and hair follicles, where they stimulate collagen synthesis and modulate various cellular pathways essential for tissue repair and regeneration.

The unique structure and size of collagen tripeptides allow them to serve not only as building blocks for collagen fibers but also as biological signals that activate fibroblasts, chondrocytes, and osteoblasts to enhance extracellular matrix (ECM) production. This dual action—nutritive and signaling—makes collagen tripeptides highly effective in improving skin texture, bone strength, and joint flexibility.

Collagen Tripeptides GPX-4™

Collagen Tripeptides GPX-4™ is a low-molecular-weight collagen peptide (LMWCP) derived from the skin of *Pangasius hypophthalmus*. With a tripeptide content of over 15%, including 3% Gly-Pro-Hyp, it is rapidly absorbed in the digestive tract and targeted to skin, joints, bones, and hair. Its dual-action benefits include stimulating structural protein synthesis and activating key cellular pathways involved in regeneration.

These tripeptides are rapidly absorbed in the small intestine and reach target tissues such as skin, joints, bones, and hair follicles. The structure and absorption profile make GPX-4™ a next-generation solution for beauty-from-within and joint/bone health supplements.

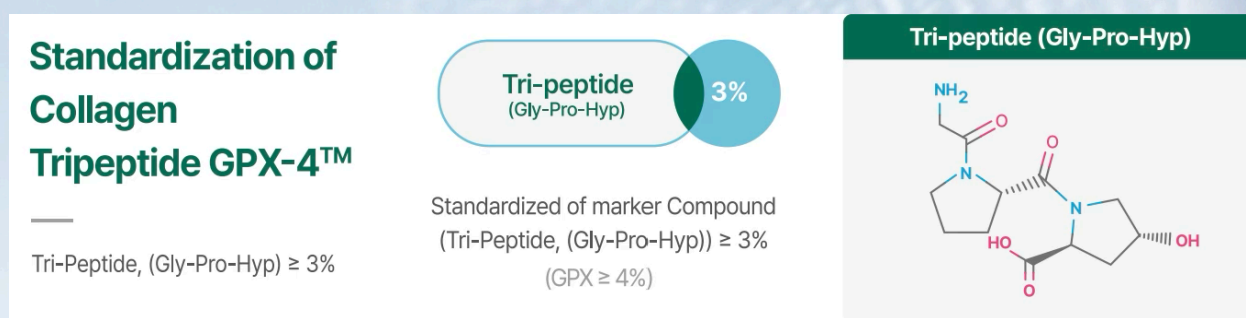


Figure 1: Structural representation and standardization of GPX-4™

Skin Health

Mechanisms of Action

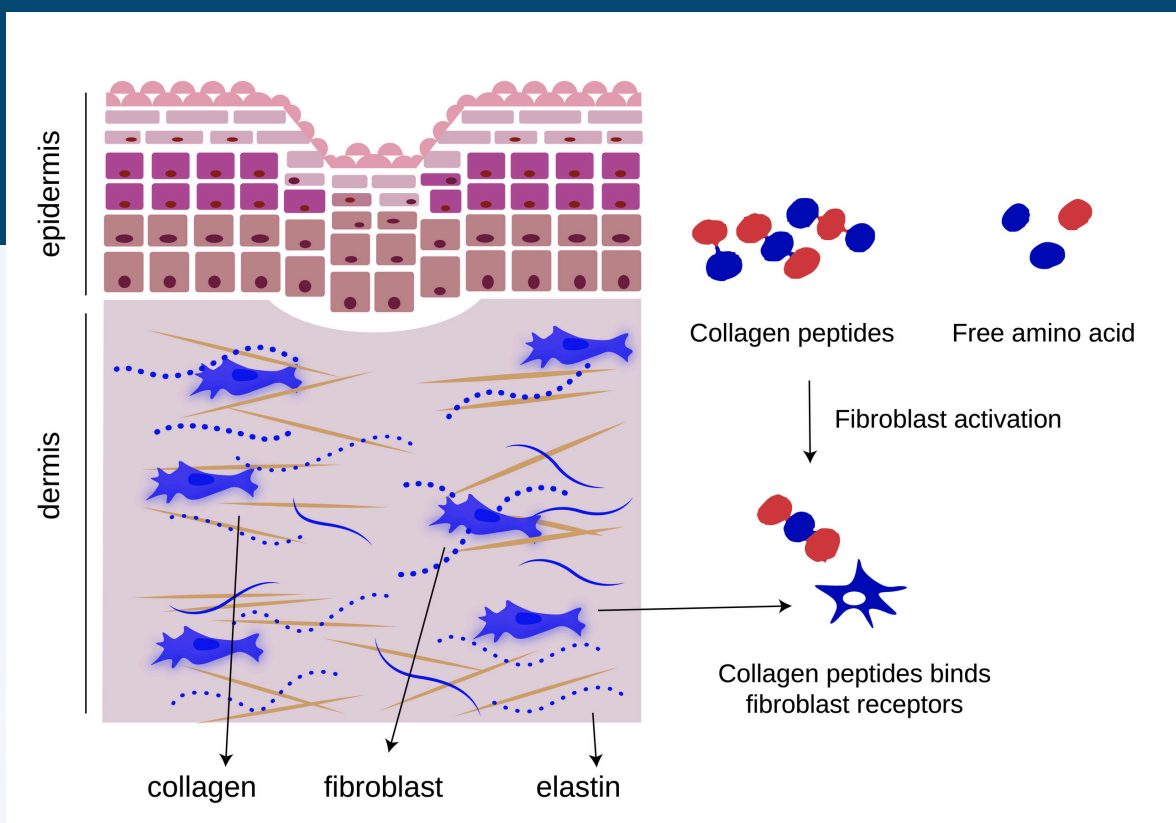


Figure 2: Pathway of collagen peptides in skin regeneration.

GPX-4™ promotes skin health through multiple mechanisms:

- **Fibroblast Activation:** Bioactive peptides, particularly Gly-Pro-Hyp, stimulate dermal fibroblasts to increase production of type I collagen and hyaluronic acid —key components for skin elasticity, moisture retention, and structural support.
- **Matrix Metalloproteinase (MMP) Inhibition:** Gly-Pro-Hyp has been demonstrated to inhibit MMPs, enzymes that degrade the extracellular matrix, thereby helping to preserve dermal collagen integrity, especially under photoaging conditions.
- **Extracellular Matrix Remodeling:** GPX-4™ enhances the synthesis and organization of collagen fibrils, contributing to improved skin firmness and reduced transepidermal water loss.

These combined actions contribute to visible anti-aging effects, including increased dermal thickness, skin hydration, and a smoother skin surface texture.

Clinical Evidence on Skin Health

A randomized, double-blind, placebo-controlled clinical study was conducted to evaluate the efficacy of low-molecular-weight collagen peptide (LMWCP), branded as GPX-4™, on multiple parameters of skin and nail health.

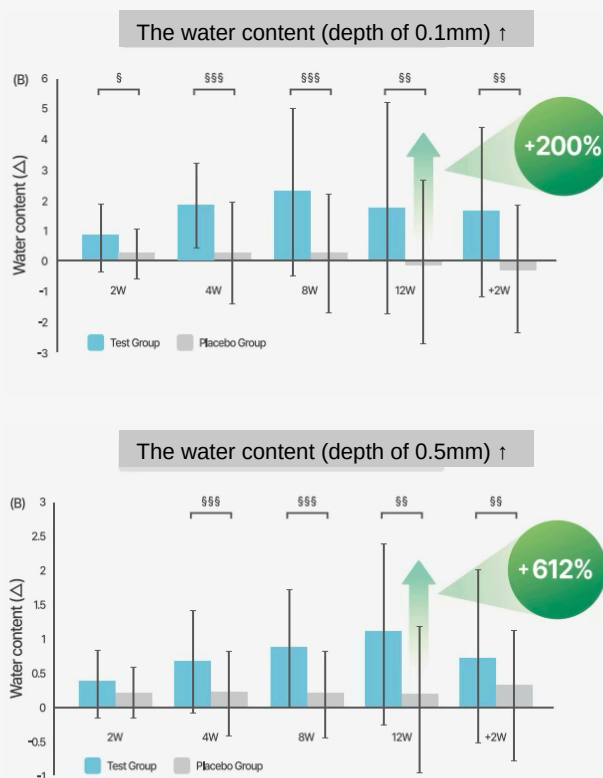
Eighty healthy female participants aged 31 to 65 were enrolled and divided into two groups: one received 1 gram per day of GPX-4™ (containing over 15% tripeptides and 3% Gly-Pro-Hyp), and the other received a placebo. The supplementation period lasted 12 weeks, followed by a two-week post-intake observation phase.

The results demonstrated clear, statistically significant improvements in skin hydration at both the superficial (0.1 mm) and deeper (0.5 mm) layers of the skin. Increases in moisture content were already noticeable by week two and continued to improve up to week twelve, with the effect sustained through the follow-up period. These findings indicate the supplement produced an early improvement in hydration that was sustained throughout the 12-week trial.

Ultrasound-based evaluations of dermal structure revealed increased dermal density and skin thickness in the GPX-4™ group. Both parameters showed marked improvement from week two onward, peaking at weeks four and eight, and notably remained elevated even after two weeks of discontinuing the supplement. These findings indicate that GPX-4™ may play a role in restoring and reinforcing the skin's structural integrity.

Improved Moisturization

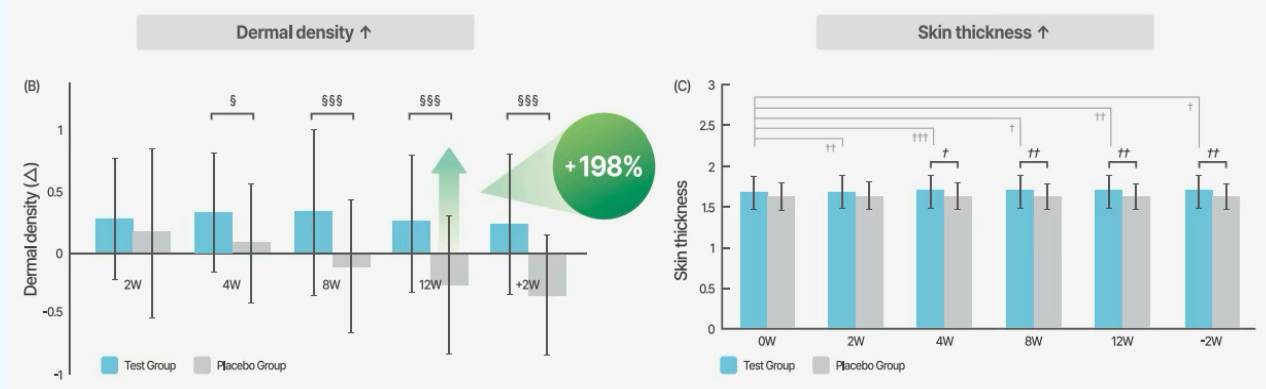
Figure 3: The effect of GPX-4 on skin hydration to a depth of 0.1 mm and 0.5 mm in the stratum corneum using a Corneometer. The study group's hydration level increased significantly by **200%** and **612%** after 12 weeks (compared to the control group).



*The study group showed significant differences vs placebo group
 (§(‡) p<0.05, §§(‡‡) p<0.01, §§§(‡‡‡) p<0.001).

Increased Dermal Density & Skin Thickness

Figure 4: The effect of GPX-4 on dermal density and skin thickness using a Derascan C. The study group's dermal density increased significantly by **198%** after 12 weeks (compared to the control group).



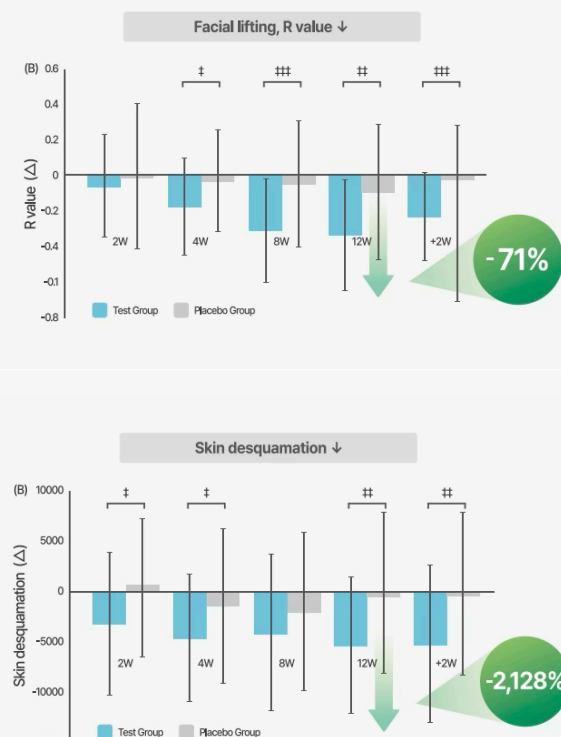
In addition to moisture retention, GPX-4™ supplementation had a lifting effect on facial contours, particularly in the lower face area. Measurements taken using moiré topography showed a reduction in sagging and an overall improved firmness starting from week four. The study also assessed skin desquamation, or surface flakiness—an indicator of dry and unhealthy skin. Participants who consumed GPX-4™ experienced a significant reduction in skin flakiness as early as week two, with improvements continuing through week twelve.

Additionally, nail surfaces roughness, another visible sign of aging and poor tissue regeneration, was reduced significantly in the GPX-4™ group by the end of the trial, with no such changes observed in the placebo group.

In summary, oral supplementation with GPX-4™ not only improved hydration and visible skin parameters such as firmness and smoothness but also enhanced internal dermal properties like density and thickness. The benefits extended to nail surface quality and were maintained beyond the supplementation period, positioning GPX-4™ as a powerful, safe, and multi-target collagen tripeptide ingredient for nutraceutical applications.

Decreased Facial Lifting & Skin Desquamation

Figure 5: The effect of GPX-4 on Facial lifting analyzed using Moir pattern. R values, which represent the angle between the horizontal line and the contour line drawn at the corner of the mouth. A decrease in the R value indicates an improvement in facial lifting significantly by **71%** and skin desquamation by **2,128%** after 12 weeks (compared to the control group).



Joint Health: Reduction of Pain in Osteoarthritis Patients

Mechanisms of Action – Joint Health

Collagen tripeptides such as GPX-4™ promote joint health by targeting the fundamental pathways involved in cartilage regeneration, inflammation modulation, and structural joint support. The mechanism includes three interrelated biological processes:



Activation of Chondrocytes

Chondrocytes are the primary cells responsible for maintaining and repairing articular cartilage. Collagen tripeptides, particularly the Gly-Pro-Hyp sequence, act as bioactive signaling molecules that stimulate chondrocyte proliferation and differentiation.

This cellular activation initiates the regeneration process by upregulating genes involved in extracellular matrix production, ensuring the joint cartilage remains resilient and functional.

Increased Production of Cartilage Collagen and Proteoglycans

Following chondrocyte activation, collagen tripeptides enhance the biosynthesis of two key structural components of cartilage:

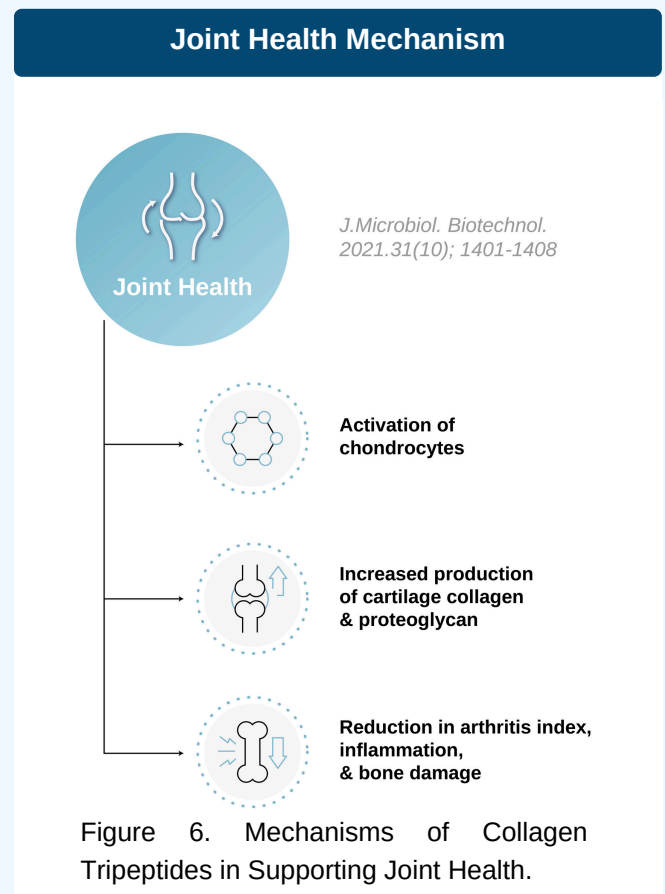
- Type II collagen, which provides tensile strength.
- Proteoglycans (such as aggrecan), which are responsible for cartilage hydration and shock absorption

Together, these molecules maintain the viscoelastic properties of the cartilage, protecting the joint during movement and load-bearing.

Reduction in Arthritis Severity, Inflammation and Cartilage or Bone Degradation

In both in vitro and in vivo studies, collagen tripeptides have been shown to reduce inflammatory cytokines (such as TNF- α and IL-1 β) and inhibit matrix-degrading enzymes like MMPs. This leads to:

- Lower arthritis severity index
- Reduced joint inflammation
- Prevention of bone deterioration and cartilage degradation
- The combined effect is an improvement in joint function and a delay in the progression of degenerative joint conditions like osteoarthritis.



Clinical Evidence on Joint Health

A rigorous, double-blind, randomized, placebo-controlled clinical study was conducted to evaluate the efficacy and safety of LMWCP, commercially branded as GPX-4™, in patients suffering from osteoarthritis (OA) of the knee. The study enrolled 78 individuals aged 40–75, diagnosed with grade I or II OA (Kellgren–Lawrence scale). Participants were randomly assigned to receive either 4g/day of GPX-4™ or a placebo for 12 weeks. The trial aimed to measure joint pain and functionality using validated instruments: the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC*) and the 100 mm Visual Analog Scale (VAS).

After 12 weeks of supplementation, patients receiving GPX-4™ reported clear and statistically significant improvements in joint pain compared with the placebo group. These benefits were consistently observed across both major assessment tools: the WOMAC* pain sub-score, which reflects specific osteoarthritis-related discomfort, and the Visual Analog Scale (VAS), a direct measure of pain intensity.

Beyond pain relief, GPX-4™ also led to significant improvements in the total WOMAC* score, which incorporates stiffness and physical function alongside pain. This broader outcome demonstrates that the supplement not only alleviates discomfort but also enhances joint flexibility and mobility, supporting better performance in daily activities.

*WOMAC is a standard OA scale where lower scores mean less pain, less stiffness and better joint function.

Interestingly, subgroup analysis revealed stronger effects in males, individuals under 50 years old, and those with higher BMI or more severe baseline pain (VAS ≥ 50 mm), indicating that GPX-4™ may be particularly beneficial for early-intervention or high-risk populations.

Importantly, no significant changes were observed in inflammatory biomarkers (ESR, hs-CRP) or knee joint space width over the 12-week period, which aligns with the early-stage OA classification of the participants. However, improvements in symptoms occurred without detectable structural changes on imaging, supporting the conclusion that GPX-4™ exerts its benefits primarily through biochemical modulation rather than anatomical restoration within the short-term study duration.

From a safety perspective, GPX-4™ was well tolerated, with no serious adverse events or clinically significant changes in laboratory parameters. Only mild, self-limiting side effects were reported, and the incidence of adverse events did not differ significantly between the test and placebo groups.

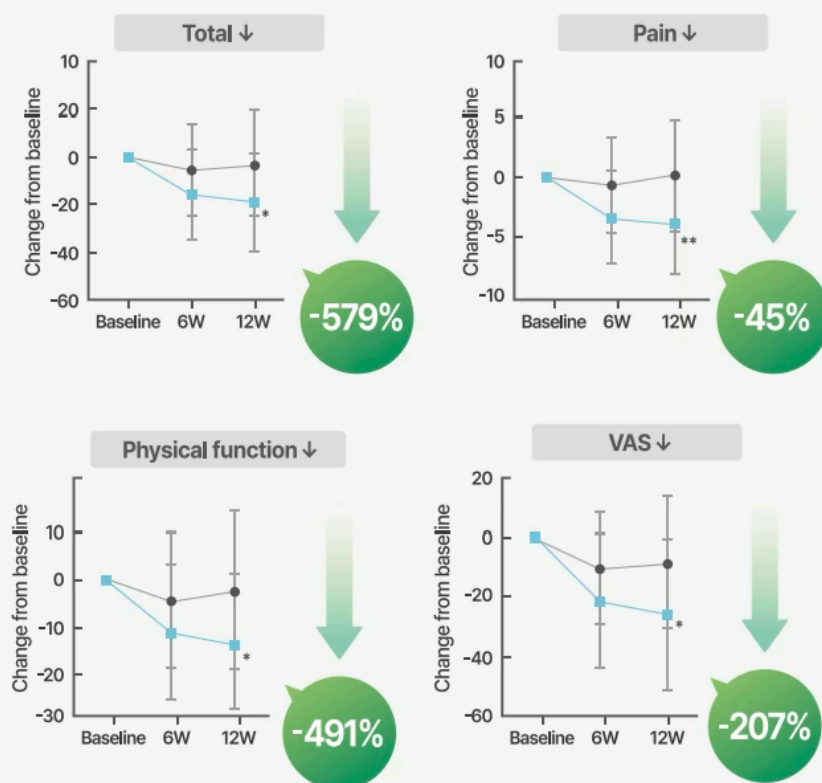
In summary, the study provides clinical evidence that GPX-4™ collagen tripeptides reduce joint pain and improve physical function in patients with early-stage knee osteoarthritis. Its excellent safety profile makes it a promising long-term option for managing joint discomfort, particularly as a natural alternative to NSAIDs or corticosteroids.

4g Intake (12 weeks)

Figure 7: Changes in the WOMAC* parameters and VAS scores from baseline to 6 and 12 weeks after treatment between the two groups..



The study group showed that after 12 weeks of supplementation with 4 g/day GPX-4™, patients showed significantly greater improvements in WOMAC total, pain, and physical function scores, as well as VAS pain, compared to placebo ($p < 0.05$). Lower scores reflect reduced pain and improved joint function.



Hair Health

Mechanisms of Action of Collagen Tripeptides on Hair Health

Hair growth and maintenance are complex biological processes regulated by cellular signaling pathways, growth factor activity, and structural protein synthesis. Recent studies have highlighted the role of Collagen Tripeptides—also referred to as LMWCPs, GPX-4—in supporting hair health, not only as structural components but also as bioactive ingredients capable of modulating follicular activity. This section summarizes the three principal mechanisms through which collagen intake promotes hair growth and hair quality.



1 Activation of the Wnt/ β -catenin Signaling Pathway

The Wnt/ β -catenin pathway plays a critical role in regulating the growth cycle of hair follicles, particularly the transition from the resting phase (telogen) to the active growth phase (anagen). Collagen peptides have been shown to upregulate phosphorylation of GSK-3 β and promote nuclear translocation of β -catenin. This results in increased expression of hair growth-related genes, including Wnt3a, LEF1, and VEGF, which drive follicular regeneration and angiogenesis. By stimulating this pathway, collagen intake enhances follicle activation and supports sustained hair growth cycles.

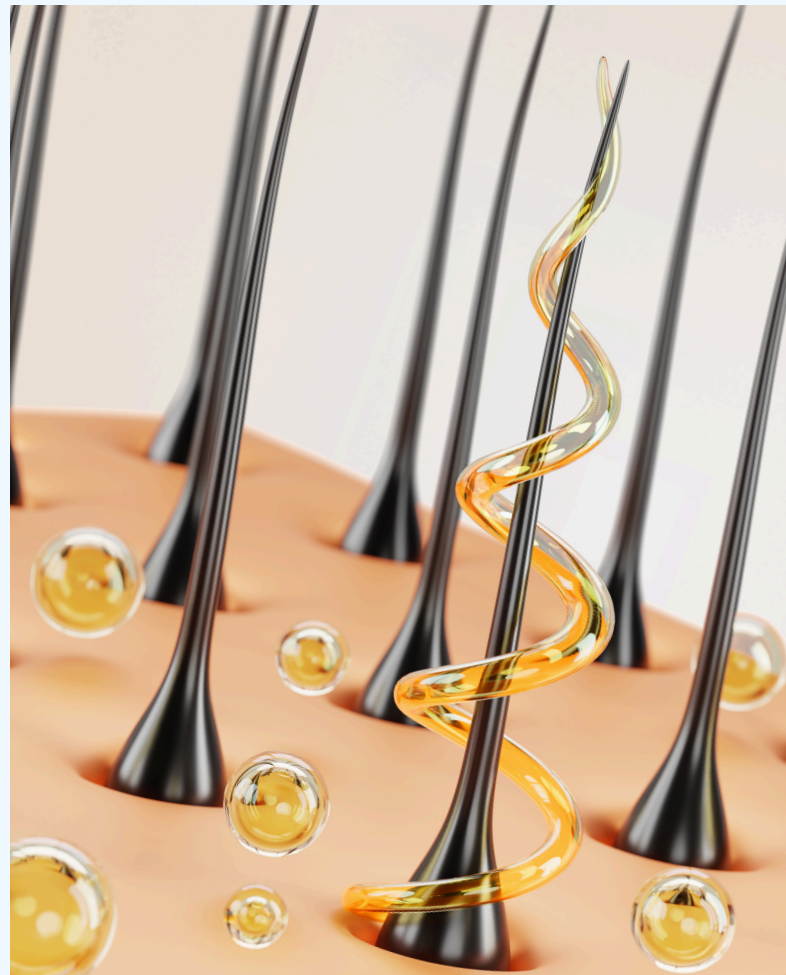
2 Enhancement of Growth Factor Secretion

Human dermal papilla cells (hDPCs) are central regulators of follicle function, largely through the secretion of growth factors that influence keratinocyte activity. Collagen intake significantly increases the release of epidermal growth factor (EGF), heparin-binding EGF (HB-EGF), fibroblast growth factor-4 (FGF-4), and FGF-6. These signaling molecules stimulate proliferation and differentiation of keratinocytes within the hair matrix, directly contributing to shaft formation and elongation. This paracrine communication enhances the metabolic and regenerative environment of the follicle.



3 Reinforcement of Keratin Expression and Hair Structure

Keratin proteins, particularly Type I and Type II hair keratins, constitute up to 95% of the hair shaft and are essential for its strength and resilience. Collagen peptides elevate the expression of cytokeratins and structural keratins, thereby reinforcing the architecture of the hair fiber. This structural support improves hair thickness, elasticity, and durability against mechanical and environmental stressors. Additionally, keratin upregulation aligns with enhanced follicular inductivity, improving overall hair density and quality.



Clinical Study Results

In vitro studies (cellular experiments)

The proliferative effect of GPX-4 was tested using cultured hDPCs. Cells were treated with various concentrations of GPX-4, and proliferation was quantified using the MTT assay, mitochondrial membrane potential analysis, and expression of cell-cycle regulators. Results showed that GPX-4 significantly promoted the proliferation of hDPCs, increasing cell viability by 10–30% and mitochondrial membrane potential by more than 80% at higher concentrations. It upregulated proliferation markers such as PCNA, Cyclin D1/E, CDK2, and CDK6, while also stimulating secretion of growth factors including EGF, HB-EGF, FGF-4, and FGF-6. In addition, LMWCP activated the Wnt/AKT/GSK-3 β / β -catenin pathway, enhancing β -catenin stabilization and nuclear translocation, which led to increased expression of Wnt3a, LEF1, and VEGF.

In 3D spheroid cultures, GPX-4 improved follicular inductivity by promoting aggregation of hDPCs and upregulating signature genes such as ALPL, SHH, FGF-7, and BMP-2, further confirmed by patch assays showing new follicle induction.

Ex vivo human follicle studies (organ culture model)

Human hair follicles isolated from scalp biopsies were cultured in media supplemented with LMWCP, with Minoxidil serving as a positive control. Follicle length was measured microscopically, and anagen duration was monitored over several days to mimic physiological growth cycles. LMWCP treatment prolonged the anagen phase and promoted follicle elongation comparable to Minoxidil. Immunostaining demonstrated increased expression of VEGF and β -catenin within follicle structures, validating the activation of angiogenesis and Wnt/ β -catenin signaling.

LMCP enhances hHF growth (hair elongation)

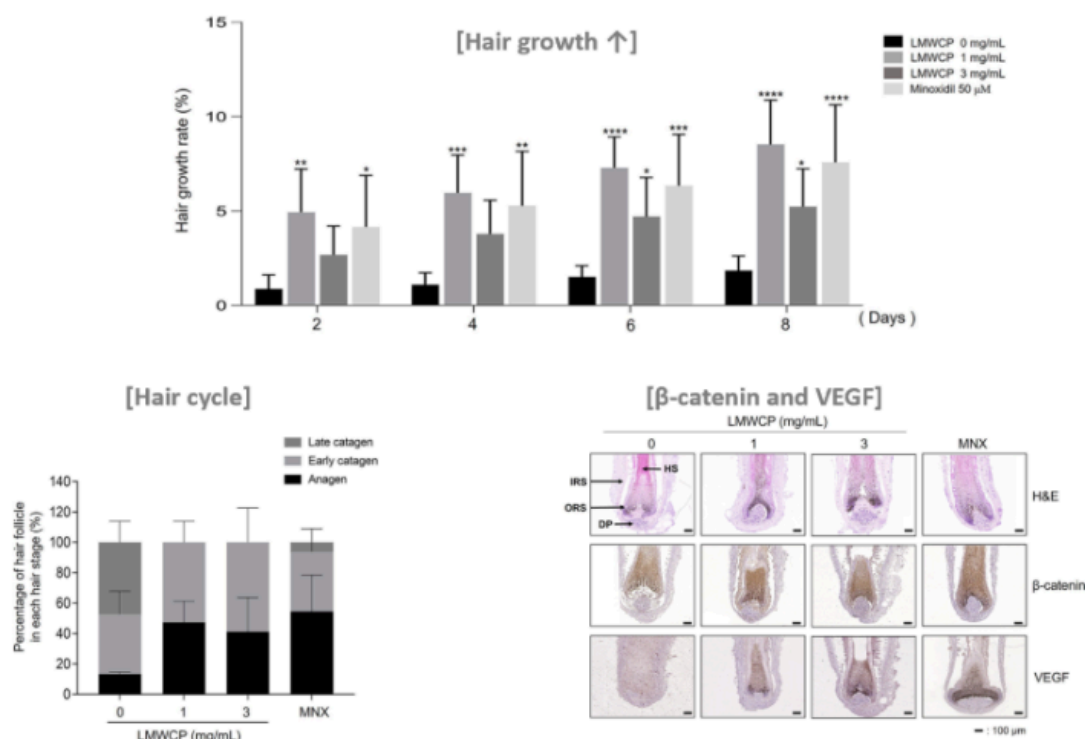


Figure 9: Effect of LMWCP on hair elongation in a hHF organ culture model.

In vivo animal studies (mouse models)

In C57BL/6 mice, oral administration of LMWCP (615 or 820 mg/kg daily for 13 days) significantly accelerated hair regrowth compared to vehicle controls, with effects comparable to Minoxidil. LMWCP-treated mice showed earlier skin darkening, larger regrowth areas, and increased dermal thickness. Histological analysis confirmed a higher number of total and anagen-phase hair follicles, while protein analysis demonstrated upregulation of Wnt3a, β -catenin, PCNA, Cyclin D1, and VEGF, supporting enhanced follicular proliferation and angiogenesis. In addition, LMWCP elevated cytokeratin expression throughout the follicle and increased levels of both Type I and Type II hair keratins in dorsal skin, reinforcing hair shaft structure. Together, these findings confirm that LMWCP promotes hair growth by accelerating telogen-to-anagen transition and strengthening follicle keratinization.

LMCP accelerates hair growth

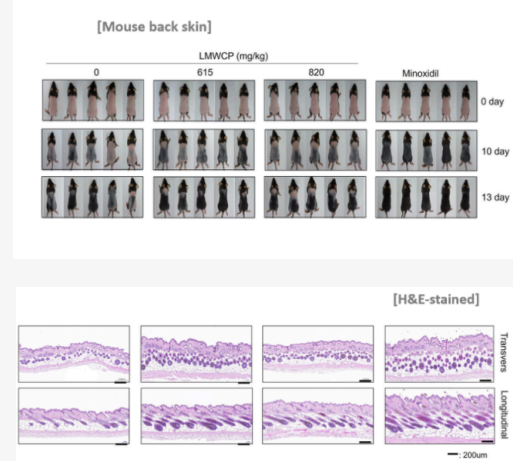


Figure 10: Effect of the LMWCP on anagen induction in 7-week-old female C57BL/6 mice

LMCP accelerates hair growth

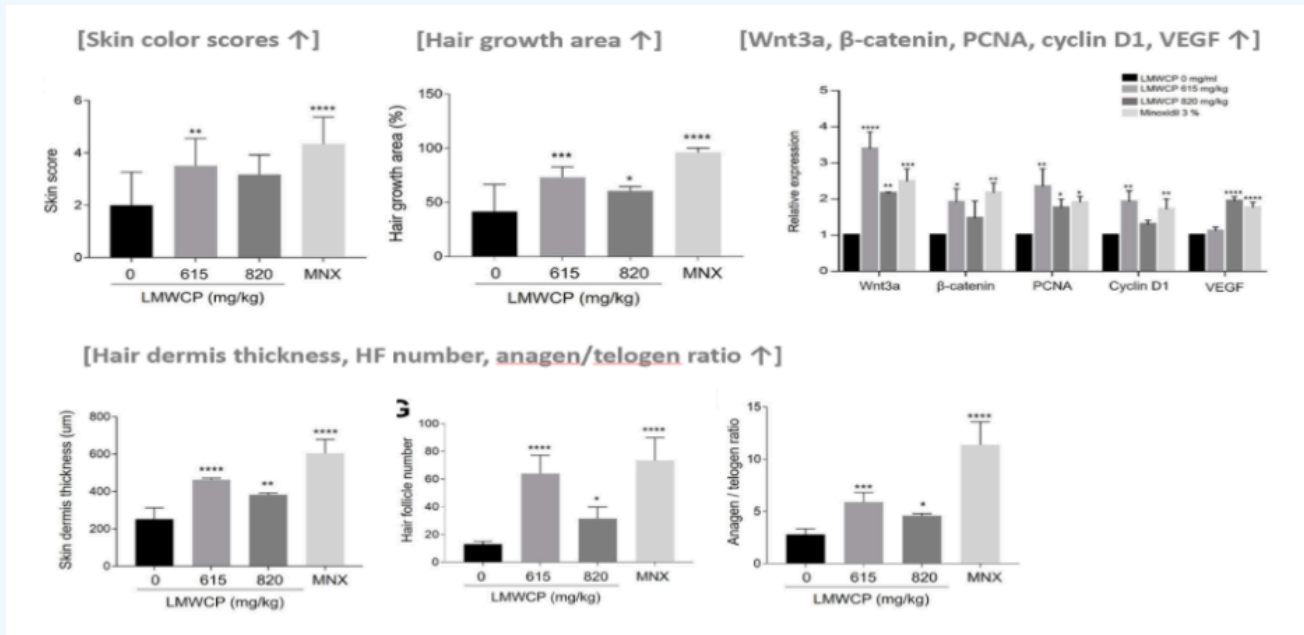


Figure 11: Effect of the LMWCP on anagen induction in 7-week-old female C57BL/6 mice

In Conclusion, across these carefully designed experimental models—cellular assays, human follicle organ culture, and in vivo animal studies—LMWCP consistently demonstrated strong activity in promoting follicle proliferation, prolonging anagen phase, and inducing new follicle formation. Together, these results provide robust preclinical evidence supporting LMWCP as a promising bioactive ingredient for improving hair density, thickness, and regeneration. While further human clinical trials will be essential to confirm translational benefits, the consistency of outcomes across in vitro, ex vivo, and in vivo studies underscores its potential as a nutraceutical intervention for hair health.



Conclusion

Collagen Tripeptides GPX-4 represents a next-generation solution for skin, joint, and hair health. Derived from a single, sustainable freshwater source (*Pangasius hypophthalmus*), GPX-4 offers a high concentration of bioactive tripeptides—particularly Gly-Pro-Hyp—that deliver both structural building blocks and biological signals for tissue repair. Clinical studies have validated its ability to improve skin hydration and elasticity, relieve joint pain in osteoarthritis patients, and stimulate hair regrowth via key molecular pathways. With proven bioavailability, fast-acting benefits, excellent safety, and regulatory recognition, GPX-4 is an ideal functional ingredient for beauty-from-within and healthy aging formulations.

The following table summarizes the core mechanisms, clinical outcomes, and product features of GPX-4:

GPX-4™: Key Features and Summary of Clinical Evidence			
Health Area	Mechanisms of Action/Characteristics	Clinical Outcomes	Key Product Features
Skin	- Activates fibroblasts → ↑ collagen & hyaluronic acid - Inhibits MMPs → ↓ collagen breakdown - Enhances ECM remodeling → ↑ dermal elasticity	↑ Skin hydration and thickness ↓ Flakiness and nail roughness ↑ Improved facial lifting	- Fast-acting visible benefits (2–4 weeks) 3% Gly-Pro-Hyp >15% Tripeptides
Joints	- Stimulates osteoblasts → ↑ ALP, COL1A1, RUNX2 - Suppresses osteoclast activity → ↓ bone resorption • Supports cartilage ECM	↓ WOMAC & VAS pain scores ↑ Joint mobility and comfort	- Proven joint relief - Natural alternative to NSAIDs - Suitable for early-stage OA
Hair	- Activates Wnt/β-catenin pathway ↑ Growth factors (FGF-7, VEGF, SHH, BMP-2) - Boosts follicle vitality & keratin production	- In vitro: ↑ hDPC proliferation, mitochondrial activity, and cell-cycle markers (PCNA, Cyclin D1/E) - Ex vivo: Prolonged anagen phase, follicle elongation, ↑ VEGF & β-catenin - In vivo: Accelerated anagen entry, earlier pigmentation, ↑ follicle density, dermal thickness, and keratinization	- Oral solution for hair loss - Stimulates regeneration - Supports healthy hair growth cycle
Safety	- Excellent tolerability in all studies - No serious adverse events - Stable lab values and no inflammation markers	- Safe for long-term use - No abnormal clinical findings	- Approved as an individually recognized ingredient by Korean MFDS (No. 2023-14) - Clean-label, consumer-friendly
Composition	- Low molecular weight peptides (~700 Da) - Rich in bioactive tripeptides (Gly-Pro-Hyp)	- Rapid absorption - Bioavailable in bloodstream and target tissues	- Sustainably sourced from freshwater Pangasius - Derived from sustainably sourced Pangasius



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