



## NAD<sup>+</sup> EXO PN

EXOSOMES [GINSENG, CICA, CAMELLIA]  
NAD<sup>+</sup> / NMN / PN





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### Exosomes

3 High-Purity Exosomes  
(Derived from Plants)

Red Panax Ginseng Callus Extracellular Vesicles  
Centella Asiatica Callus Extracellular Vesicles  
Camellia Japonica Callus Extracellular Vesicles

### NAD<sup>+</sup>

Nicotinamide Adenine Dinucleotide

High-purity 98% +  
Increase absorption rate, cell function activation  
and antioxidant effect

### NMN

Nicotinamide Mononucleotide

### PDRN & PN

PolyNucleotide, Sodium DNA

Made by a French manufacturer From Wild Alaskan  
Salmon. High-purity PDRN 30,000 ppm  
High-purity PN 10,000 ppm

### Collagen & Peptides

Atelocollagen, Hydrolyzed Collagen, 8 Peptides



# NMN | Exosome + NAD<sup>+</sup> & NMN

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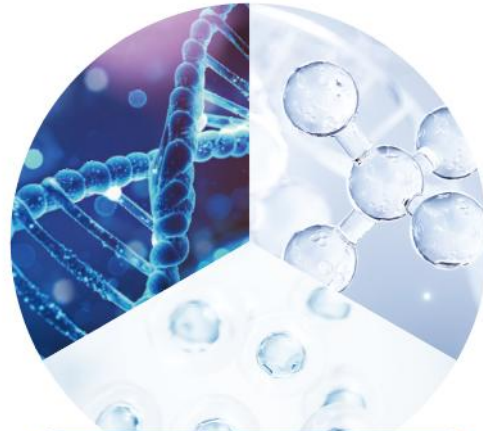
NAD<sup>+</sup> EXO PN is a product that extracts exosomes, a key active ingredient, from three plant stem cell cultures beneficial to the skin. Synthesizes and nanosizes NAD<sup>+</sup>, NMN and exosomes to increase skin absorption of various cell-active ingredients.



3 Exosomes



Red Ginseng,  
Cica, Camellia



Exosome + NAD<sup>+</sup> & NMN



Extracts exosome components from 0.5% of stem cell culture, and synthesizes nanosized NAD, NMN, and exosomes. Achieves a high absorption rate, being 184–462 times smaller than skin pores.



Cellular Rejuvenating

NAD<sup>+</sup> and NMN recharge cellular energy and activate DNA repair pathways for deep rejuvenation. Exosomes deliver bio-signals and growth factors that enhance regeneration and collagen renewal. Together, they create a Triple Regeneration Synergy



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## Triple Regeneration Complex for Ultimate Skin Revival

Recharging

Repairing

Defense

Rejuvenating

A next-generation skin booster that combines cellular energy regeneration (NAD : Nicotinamide Adenine Dinucleotide, NMN : Nicotinamide Mononucleotide) with biological repair signaling (Exosomes) for comprehensive skin rejuvenation.

1

### Energy Recharge

The root cause of skin aging is decrease in cellular energy. The combination of NAD and NMN activates cellular energy to revitalize the skin, while exosomes deliver these beneficial signals to promote skin cell recovery.

2

### Repair & Regeneration

NAD<sup>+</sup> stimulates DNA repair through PARP activation, correcting cellular damage. While NMN balances cell turnover and metabolism for faster tissue renewal. Exosomes deliver growth factors that activate fibroblast, promoting skin repair and regeneration.

3

### Defense & Protection

NAD<sup>+</sup> / NMN combination reduces oxidative stress and inflammation through Sirtuin activation. Exosomes restore skin homeostasis and strengthen the lipid barrier. Together, they create a continuous protection loop against aging and external stress.

4

### Rejuvenating

Exosomes deliver biomimetic growth factors and microRNAs that activate cellular repair. The NAD–NMN–Exosome triad enhances Sirtuin activation, reduces oxidative stress, and slows the visible signs of aging.



## WHY NAD<sup>+</sup> & NMN ?

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**Cellular Energy Rejuvenation Technology. Revive cellular vitality and restore youthful skin energy.**

The primary cause of skin aging is cellular energy depletion. As we age, NAD<sup>+</sup> levels drop dramatically, leading to mitochondrial decline. NMN is converted into NAD<sup>+</sup> within skin cells to replenish energy, while NAD<sup>+</sup> utilizes that energy to promote cellular regeneration, DNA repair, and antioxidant defense. Together, they fundamentally enhance skin vitality, elasticity, and recovery.

### Cellular Energy Activation

NAD<sup>+</sup> and NMN synergistically recharge cellular energy metabolism, boosting mitochondrial ATP production for vibrant, revitalized skin.

### DNA Repair & Regeneration

Activates PARP enzymes to accelerate DNA repair, enhance post-treatment recovery, and strengthen the skin's regenerative capacity.

### Collagen & Elasticity Boost

Stimulates fibroblast activity and enhances collagen and elastin synthesis for firm, lifted, and youthful skin.

### Antioxidant & Anti-aging Defense

Activates Sirtuin pathways (SIRT1, SIRT3), reducing oxidative stress, preventing inflammation, and slowing the signs of skin aging.

### Barrier Strengthening & Hydration

Enhances filaggrin and ceramide synthesis to strengthen the skin barrier and support long-lasting hydration.

### Radiance & Tone Enhancement

Regulates melanin production, normalizes cell turnover, and brightens dull skin for a radiant, luminous complexion.

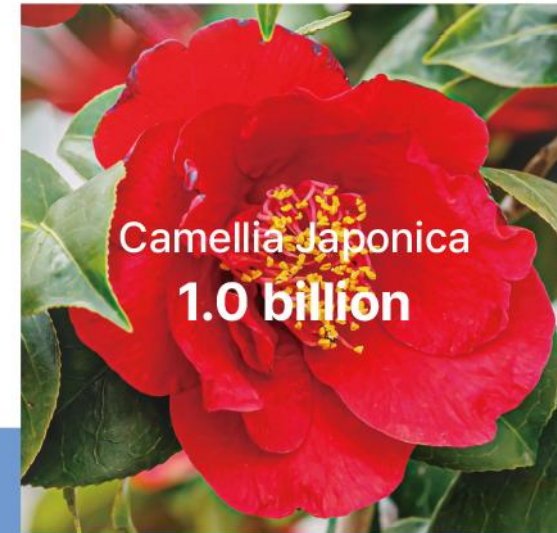
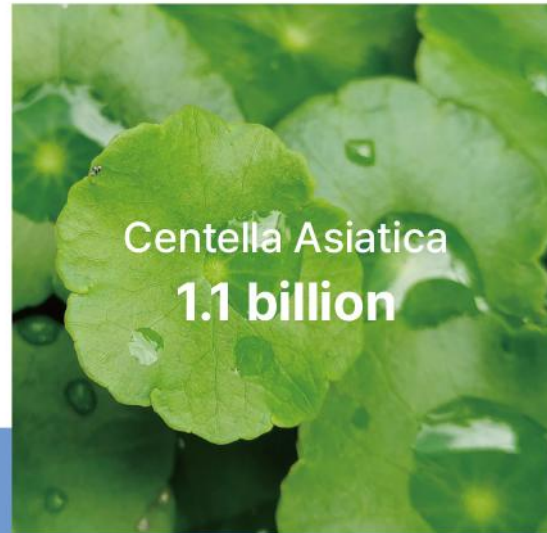


## 3 Exosome + NAD<sup>+</sup> & NMN + PDRN + Collagen & Peptides

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### 3 Exosomes

This technology extracts exosomes, a key active ingredient, from the culture medium of three plant stem cell (callus) types, supporting skin improvement and cellular growth. Nanosized exosomes enhance the absorption of active ingredients. High-purity exosomes are directly isolated and purified from 3 plant stem cell (callus) cultures.



### 3 Exosomes Particles

The ultra-nano particles contain of about 14 billion/ml of purified high-purity exosomes alone.

- Red Ginseng : 11 billion, CICA : 1.1 billion, Camellia : 1.0 billion

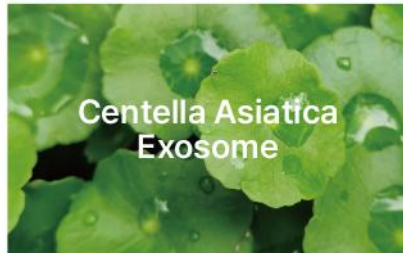


## 3 Plant-derived Exosomes

High-purity exosomes are purified and isolated exclusively from the core active ingredients of plant stem cell (callus) culture medium.



Ginsenosides (Saponin) help regenerate aging skin cells, promote the synthesis of hyaluronic acid, a natural moisturizing factor in the dermis of the skin, and provides skin elasticity. They also inhibit the activity of Tyrosinase, which regulates melanogenesis, preventing excessive pigmentation and helping maintain bright, even skin tone.



Phytosterol, Glycoside Tannin ingredients promote skin cell regeneration and provide antibacterial, anti-inflammatory and wound healing effects. Madecassic Acid, Asiaticoside support collagen synthesis, improve skin elasticity, and help prevent signs of aging.



Rich in flavonoids, polyphenols, catechins, methionine, and other active compounds this ingredient offers excellent antioxidant properties, which help protect the skin from internal and external irritants. They also have moisturizing effects, inhibiting inflammation, shrinking pores, and controls excessive sebum secretion.

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### PDRN

High-purity PDRN 30,000 ppm

High-purity PN 10,000 ppm

PDRN is made by a French manufacturer derived from wild Alaskan salmon.

PDRN is authorized by European Health Authorities (USA and Canada)

Promotes and increases skin hydration

OH<sup>°</sup> free radical scavenger

Reconstruction of damaged skin

Anti UV light

Reinforces the antioxidant barrier of the skin





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## Collagen & Peptides

- EGF, FGF, IGF : Collagen & Elastin regeneration growth factors
- Atelocollagen, Hydrolyzed Collagen : Promote the synthesis of collagen and elastin, Doubles the moisturizing effect compared to hyaluronic acid Provides elasticity to the skin and prevents sagging
- Glutathione : Excellent whitening effect due to melanin suppression effect. Helps delay skin aging with powerful antioxidant effect.
- 8 (Amino Acid) Peptides : made from 99% high purity powder raw materials

Galloyl Pentapeptide-74(SEATIDE)

Effective for Anti-wrinkle with high collagen mRNA expression

Nicotinoyl Tripeptide-1

Effective for powerful antioxidant, soothing and anti-inflammatory

Nonapeptide-1

Helps improve bright clean skin tone by reducing multi-pigmentation

Acetyl Hexapeptide-8

Effective for Anti-wrinkle by inhibiting skin muscle contraction

Palmitoyl Pentapeptide-4

Increasing collagen and preventing elastin decomposition

Palmitoyl Tetrapeptide-7

Increasing collagen and preventing elastin decomposition

Biotinoyl Tripeptide-1

Preventing melanin production in the skin for whitening effect

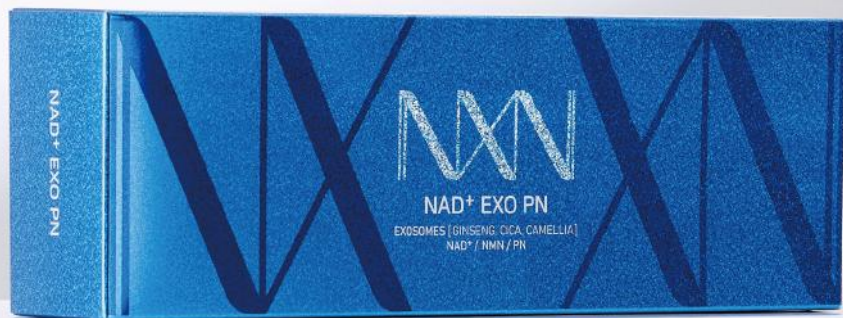
Glycine Soja (Soybean) Peptide

Promotes collagen synthesis and adds elasticity to the dermis



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**Clinic Report on Efficacy &  
Rate of change by test item**



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## Clinic Report on Efficacy



No. 1 EXOSOME + NAD<sup>+</sup>, NMN, Freeze-Dried Ampoule  
No. 2 PDRN + Collagen + Peptides, Solvent Ampoule

KDRI-2025-937

Assessment of Anti-aging Effect

Summary of Test Result			
TITLE	Anti-Aging Clinical Evaluation of "NAD EXO PN"		
INSTITUTE	Korea Dermatology Research Institute	PERIOD	Feb. 02. 2025 ~ Jun. 23. 2025
TEST METHOD	Sample Form	White solid & clear liquid	Test Period Feb. 02. 2025 ~ Jun. 23. 2025
	Number of Sample	2 EA (Test Sample, Placebo Sample)	Number of Subjects 16
	Treatment	Self-application by subjects	
Detail on Test Method	1. Subject Selection : 16 subjects who met the selection criteria and did not meet the exclusion criteria were selected 2. Application Method : Mix the NAD-Exo PN and Skin solvent evenly and use them twice a day in the morning and evening 3. Evaluation Method a. Assessment of using Antera 3D b. Assessment of using Corneometer® c. Assessment of using Cutometer® d. Assessment of using Ultrasound e. Assessment of using Mexameter f. Cutaneous irritation evaluation by dermatologist		
TEST RESULT	As a result of the testing on 16 subjects during the 4 weeks test period, the test area using the "NAD EXO PN" sample showed a statistically significant (p<0.05) improvement in the eye wrinkles, skin moisturizing, skin elasticity, dermal density and melanin index (M-value) after sample application compared to before sample application and showed a statistically significant difference (p<0.05) even in comparison with the placebo area using the placebo sample. Therefore, it is judged that the test sample can help anti-aging. In addition, no special adverse reaction was observed during the testing period, therefore the sample is considered to be safety. (There may be temporary changes and individual differences.)		
ATTACHED DATA	Data of test result		

KDRI-2025-937

Assessment of Anti-aging Effect

### 12. Discussion and Conclusions

This clinical study was designed to evaluate "NAD EXO PN" focuses on the efficacy of anti-aging for the 4 weeks. The test was done for total 16 subjects and all the subjects completed the study with out any dropouts.

The results of the experiment are as follows.

1) The eye wrinkle index of the test area decreased to 9.30% after 2 weeks of sample application and 17.89% after 4 weeks of the test compared to before the test. And the eye wrinkle index

of the placebo area increased 0.51% after 2 weeks and decreased 0.46% after 4 weeks.

2) The skin water content of the test area increased to 12.35% after 2 weeks of sample application and 23.15% after 4 weeks of the test compared to before the test. And the skin water content of the placebo area increased 1.35% after 2 weeks and increased 0.99% after 4 weeks.

2) The epidermis elasticity of the test area increased to 16.57% after 2 weeks of sample application and 28.78% after 4 weeks of the test compared to before the test. And the epidermis elasticity of the placebo area decreased 2.06% after 2 weeks and decreased 1.60% after 4 weeks.

4) The dermal density of the test area increased to 22.89% after 2 weeks of sample application and 40.32% after 4 weeks of the test compared to before the test. And the dermal density of the placebo area increased 8.13% after 2 weeks and increased 15.19% after 4 weeks.

5) The melanin value of the test area decreased to 4.23% after 2 weeks of sample application and 11.27% after 4 weeks of the test compared to before the test. And the melanin value of the placebo area decreased 0.005% after 2 weeks and increased 0.99% after 4 weeks.

5) As a result of the expert visual evaluation, the pigmentation grade of the test area decreased to 0.03 after 2 weeks of sample application and 0.03 after 4 weeks of the test compared to before the test, and no change according to the sample use period was observed in the



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## Papers related to Exosome and NAD (NMN)

NAD EXO PN is a product that extracts exosomes, a key active ingredient, from three plant stem cell cultures beneficial to the skin and synthesizes and nanonizes NAD and exosomes to increase skin absorption of various cell-active ingredients.

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Review > J Drugs Dermatol. 2025 Jan 1;24(1):12-18. doi: 10.36849/JDD.8872.

### Exosomes in Cosmetic Dermatology: A Review of Benefits and Challenges

Diala Haykal, Saranya Wyles, Lilit Garibyan, Hugues Cartier, Michael Gold

Article

### Dermal Delivery of Korean Red Ginseng Extract: Impact on Storage Stability of Different Carrier Systems and Evaluation of Rg1 and Rb1 Skin Permeation Ex Vivo

Victoria Klang<sup>1,\*</sup>, Eva-Maria Schweiger<sup>1</sup>, Simone Strohmaier<sup>1</sup>, Verena Ina Walter<sup>1</sup>, Zorana Dekic<sup>1</sup> and Ammar Tahir<sup>2</sup>

<sup>1</sup> Department of Pharmaceutical Sciences, Division of Pharmaceutical Technology and Biopharmaceutics, University of Vienna, Josef-Helzlsouer-Platz 2, 1080 Vienna, Austria  
<sup>2</sup> Department of Pharmaceutical Sciences, Division of Pharmacognosy, University of Vienna, Josef-Helzlsouer-Platz 2, 1080 Vienna, Austria

Journal of Ginseng Research 48 (2024) 213–219  
Contents lists available at ScienceDirect

Research Article

### Ginseng root-derived exosome-like nanoparticles protect skin from UV irradiation and oxidative stress by suppressing activator protein-1 signaling and limiting the generation of reactive oxygen species

Wooram Choi<sup>1,\*</sup>, Jeong Hun Cho<sup>1,2</sup>, Sang Hee Park<sup>1,2</sup>, Dong Seon Kim<sup>1</sup>, Hwa Pyoung Lee<sup>1</sup>, Donghyun Kim<sup>1</sup>, Hyun Soo Kim<sup>1</sup>, Ji Hye Kim<sup>1</sup>, Jae Youl Cho<sup>1,2</sup>

<sup>1</sup>Department of Integrative Biotechnology, SanggyeWook University, Seoul, Republic of Korea

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National Center for Biotechnology Information

> Front Pharmacol. 2021 Oct 4;12:716248. doi: 10.3389/fphar.2021.716248. eCollection 2021.

### Anti-Photoaging and Anti-Inflammatory Effects of Ginsenoside Rk3 During Exposure to UV Irradiation

Shichao Wan<sup>1,2,3</sup>, Yannan Liu<sup>1,2,3</sup>, Jingjing Shi<sup>1,2,3</sup>, Daidi Fan<sup>1,2,3</sup>, Binglin Li<sup>4</sup>

Affiliations + expand

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> J Ginseng Res. 2020 Sep;44(5):738-746. doi: 10.1016/j.jgr.2019.08.004. Epub 2019 Aug 21.

### Effects of red ginseng on the elastic properties of human skin

Moon Young Park<sup>1</sup>, Se Jik Han<sup>1,2</sup>, Donggerami Moon<sup>1</sup>, Sangwoo Kwon<sup>1</sup>, Jin-Woo Lee<sup>3</sup>, Kyung Sook Kim<sup>1</sup>

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National Center for Biotechnology Information

> Biomed Pharmacother. 2024 Jul;176:116855. doi: 10.1016/j.biopha.2024.116855. Epub 2024 Jun 7.

### Investigating the proliferative inhibition of HepG2 cells by exosome-like nanovesicles derived from Centella asiatica extract through metabolomics

JingYi Huang<sup>1</sup>, XiaoYu Cao<sup>1</sup>, WenFeng Wu<sup>2</sup>, Liang Han<sup>3</sup>, FengYun Wang<sup>4</sup>

### Multifaceted Therapeutic Potential of Plant-Derived Exosomes: Immunomodulation, Anticancer, Anti-Aging, Anti-Melanogenesis, Detoxification, and Drug Delivery

by Arzu Zeynep Karabay<sup>1</sup>, Jaleh Darar<sup>2</sup>, Yalda Heikmatshoar<sup>3</sup> and Yalda Rahbar Saadat<sup>4,\*</sup>

<sup>1</sup> Department of Biochemistry, Faculty of Pharmacy, Ankara University, 06560 Ankara, Türkiye  
<sup>2</sup> Department of Pharmaceutical Sciences, College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL 33328, USA  
<sup>3</sup> Department of Medical Biology, Faculty of Medicine, Atinbas University, 34217 Istanbul, Türkiye  
<sup>4</sup> Kidney Research Center, Tabriz University of Medical Sciences, Tabriz 5165665811, Iran  
\* Author to whom correspondence should be addressed.

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> BMC Complement Altern Med. 2019 Jan 28;19(1):30. doi: 10.1186/s12906-018-2405-4.

### Protective effects of Camellia japonica flower extract against urban air pollutants

Minkyung Kim<sup>1</sup>, Dahee Son<sup>1</sup>, Seoungwoo Shin<sup>1</sup>, Deokhoon Park<sup>1</sup>, Sangyo Byun<sup>2</sup>, Eunsun Jung<sup>3</sup>

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Review > J Cell Mol Med. 2023 Mar;27(5):593-608. doi: 10.1111/jcmm.17635. Epub 2023 Feb 8.

### Therapeutic properties and pharmacological activities of asiaticoside and madecassoside: A review

Shinjini Bandyopadhyay<sup>1</sup>, Sujata Mandal<sup>2</sup>, Mimosha Ghorai<sup>2</sup>, Niraj Kumar Jha<sup>3,4,5</sup>



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> Cells. 2024 Oct 30;13(21):1799. doi: 10.3390/cells13211799.

**Novel Approach to Skin Anti-Aging: Boosting Pharmacological Effects of Exogenous Nicotinamide Adenine Dinucleotide (NAD<sup>+</sup>) by Synergistic Inhibition of CD38 Expression**

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National Center for Biotechnology Information

Randomized Controlled Trial > Exp Dermatol. 2007 Jun;16(6):490-9.  
doi: 10.1111/j.1600-0625.2007.00553.x.

**A topical lipophilic niacin derivative increases NAD, epidermal differentiation and barrier function in photodamaged skin**



Communication

**Supplementation of Nicotinic Acid and Its Derivatives Up-Regulates Cellular NAD<sup>+</sup> Level Rather than Nicotinamide Derivatives in Cultured Normal Human Epidermal Keratinocytes**

Takahiro Oyama <sup>1,2,\*</sup>, Takumi Yamamoto <sup>1</sup>, Takeshi Kameda <sup>1</sup>, Takanori Kamiya <sup>1</sup>, Hideaki Abe <sup>1</sup>, Takehiko Abe <sup>1</sup> and Sei-ichi Tanuma <sup>2</sup>

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> Plast Reconstr Surg. 2022 Oct 1;150(4 Suppl ):415-485. doi: 10.1097/PRS.00000000000009673.  
Epub 2021 Sep 28.

**The Role of NAD<sup>+</sup> in Regenerative Medicine**

Nichola J Conlon <sup>1</sup>

Affiliations + expand

PMID: 36170435 PMID: PMC9512238 DOI: 10.1097/PRS.00000000000009673

### Abstract

The understanding of the molecular and cellular basis of aging has grown exponentially over recent years, and it is now accepted within the scientific community that aging is a malleable process; just as it can be accelerated, it can also be slowed and even reversed. This has far-reaching implications for our attitude and approach toward aging, presenting the opportunity to enter a new era of cellular regenerative medicine to not only manage the external signs of aging but also to develop therapies that support the body to repair and restore itself back to a state of internal well-being. A wealth of evidence now demonstrates that a decline in cellular nicotinamide adenine dinucleotide (NAD<sup>+</sup>) is a feature of aging and may play a role in the process. NAD<sup>+</sup> plays a pivotal role in cellular metabolism and is a co-substrate for enzymes that play key roles in pathways that modify aging. Thus, interventions that increase NAD<sup>+</sup> may slow aspects of the aging trajectory, and there is great interest in methods for cellular NAD<sup>+</sup> restoration. Given these recent advancements in understanding the cellular aging process, it is important that there is an integration between the basic scientists who are investigating the underlying mechanisms of cellular aging and the surgeons and aesthetic practitioners who are providing antiaging therapies. This will allow the effective translation of this vastly complex area of biology into clinical practice so that people can continue to not only stay looking younger for longer but also experience improved health and wellness.

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**Permeation of Nicotinamide Mononucleotide (NMN) in an Artificial Membrane as a Cosmetic Skin Permeability Test Model**

Risako Betsuno <sup>1</sup>, Takuya Yamane <sup>1,2,6,8</sup>, Hiroko Tsuji <sup>1</sup>, Yu Nakajima <sup>1</sup>, Momoko Imai <sup>1,2</sup>, Takeshi Bamba <sup>2,3</sup>, Susumu Uchiyama <sup>1,2,6,8</sup>

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PMCID: PMC12048825 PMID: 40317586

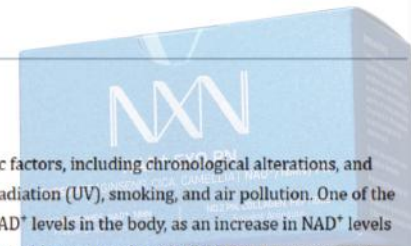
### ABSTRACT

#### Background

Skin aging progresses owing to intrinsic factors, including chronological alterations, and extrinsic factors, including ultraviolet radiation (UV), smoking, and air pollution. One of the mechanisms of aging is a decrease in NAD<sup>+</sup> levels in the body, as an increase in NAD<sup>+</sup> levels prevents skin aging phenotypes. Nicotinamide mononucleotide (NMN) is a precursor of NAD<sup>+</sup> in the salvage pathway and the primary source of NAD<sup>+</sup> in mammals.

#### Aim

This Study Aimed to Evaluate the Permeability, Functionality, and Stability of NMN in Cosmetics.





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## Thesis Papers on Clinical Trials



## RESEARCH ARTICLE

Kor. J. Aesthet. Cosmetol.,  
Vol. 11 No. 5, 877-882, October 2013

### 홍삼에 함유된 프로토파낙사트리올계 전환사포닌의 피부주름 개선효과

이상명<sup>1</sup>, 임영호<sup>1</sup>, 김석창<sup>1</sup>, 최재환<sup>1</sup>, 김진희<sup>2\*</sup>

<sup>1</sup>한국인삼공사 중앙연구소, <sup>2</sup>대구한의대학교 한방피부미용학과

### Anti-wrinkle Effects of Converted Protopanaxatriol Prepared from Korean Red Ginseng

Sang Myung Lee<sup>1</sup>, Young Ho Im<sup>1</sup>, Seok Chang Kim<sup>1</sup>, Jae Hwan Choi<sup>1</sup>, Jin Hee Kim<sup>2\*</sup>

<sup>1</sup>Korea Ginseng Corporation Central Research institute

<sup>2</sup>Department of Herbal Skin Care, Daegu Haany University

**Abstract** In order to study about human skin anti-wrinkle effect of red ginseng, red ginseng extracts and the fractions were tested to inhibition effect against MMP-2, -9, and -1 expression in human fibroblast cells by gelatin zymography and RT-PCR methods. The red ginseng samples are red ginseng extract extracted with hot water, crude saponin as butanol soluble fraction, major ginsenosides, protopanaxatriol conversions, protopanaxadiol conversions as the fractions fractionated by C<sub>18</sub> reverse phase resin and various proportions of aqueous acetonitrile. We found that propanaxatriol conversions fraction one of the red ginseng samples inhibited in a concentration-dependent manner against MMP-2, and -9 expression levels in human fibroblast cells irradiated by UV light. By HPLC analysis, protopanaxatriol conversions fraction consisted on ginsenosides Rk<sub>3</sub>, F<sub>4</sub>, Rg<sub>6</sub>, and Rh<sub>4</sub>. These results suggest that dehydrates of protopanaxatriol ginsenoside from red ginseng have an anti-wrinkle activity through inhibition of MMP-2, and -9 expression in skin.

**Keywords:** Panax ginseng, Protopanaxatriol, MMPs, Anti-wrinkle



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journal homepage: [www.sciencedirect.com/journal/journal-of-ginseng-research](http://www.sciencedirect.com/journal/journal-of-ginseng-research)

Review Article

## Ginseng and ginseng byproducts for skincare and skin health

Ji-Hun Kim<sup>a</sup>, Rami Lee<sup>a</sup>, Sung-Hee Hwang<sup>b</sup>, Sun-Hye Choi<sup>c</sup>, Jong-Hoon Kim<sup>d</sup>, Ik-Hyun Cho<sup>e</sup>, Jeong Ik Lee<sup>f</sup>, Seung-Yeol Nah<sup>a,\*</sup>

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**Keywords:**  
Ginseng  
Ginsenosides  
Gintonin  
Lysophosphatidic acid  
Cosmetic ingredients  
Cosmetics

### ABSTRACT

Ginseng is a traditional herbal medicine with a long history of use for the prevention and/or treatment of various diseases. Ginseng is used worldwide as a functional food to maintain human health. In addition, ginseng has been used as a raw ingredient in cosmetics with various applications, ranging from skin toning to anti-aging. Some cosmetic products contain ginseng extracts from Korea and other countries, as it is thought that ginseng can also exert beneficial effects on human skin. However, it remains unclear which ginseng component(s) could be the main active compound that directly contributes to skin health and/or prevents skin aging. It is also important to understand the mechanisms by which the ginseng component(s) exert their effects on the skin and skin health. This review describes recent *in vitro* and *in vivo* studies involving ginseng extracts, ginseng ingredients, and ginseng byproducts for skincare and skin health and discusses emerging evidence that ginsenosides, gintonin, and ginseng byproducts could be novel candidates for skincare and skin health applications ranging from anti-aging to the treatment of skin diseases such as atopic dermatitis and hypertrophic scars and keloids. The mechanisms underlying the beneficial effects of ginseng components and byproducts on skin health are discussed. In addition, this review shows how ginseng components, such as gintonin, a newly identified ginseng component, might contribute to skin health and skin disease when used as a supplementary ingredient in cosmetics and further proposes a novel combination in cosmetic products containing both ginsenosides and gintonin.

## 7. Conclusion

Recent *in vitro* and *in vivo* studies, as described above, suggest that ginseng ingredients can be used in functional and medicinal cosmetics because they exhibit anti-skin aging and anti-wrinkle effects, facilitate wound healing and whitening, stimulate hair growth, and even inhibit hypertrophic scars and keloids [28,42–47] (Table 1). Developing target-oriented functional or medical cosmetics with enhanced levels of ginseng ingredients matching those in functional foods containing ginseng may be necessary. However, it might not be easy to enhance ginseng ingredients in cosmetics, as ginseng root itself is an expensive herb, and individual ginsenosides are even more expensive. An alternative for lowering the cost of ginseng ingredients is to utilize ginseng byproducts produced during the cultivation and processing of red ginseng products. This could be a way to upcycle ginseng byproducts and increase their added value [99].

In addition, if different ginseng components or fractions are combined as cosmetic ingredients, they can complement each other, leading to additive or synergistic effects for skincare and skin health. For example, although target membrane receptors for ginsenosides do not exist, they have been proven to exert beneficial effects through non-receptor-mediated mechanisms, such as non-specific antioxidative and anti-inflammatory effects within the skin system [100]. In contrast, ginseng-derived gintonin or KRGM gintonin-containing LPAs have a high affinity for membrane LPA receptor subtypes in skin cells and exert specific cascade effects through these receptors using  $[Ca^{2+}]_i$  transients [64]. Thus, by adding both ginsenosides and gintonin, the non-receptor-mediated anti-oxidative stress effects and anti-inflammatory effects, respectively, can be combined in a single cosmetics product, as the effects of gintonin, which are achieved through LPA receptor regulation, distinguish it from those of ginsenosides and ginseng polysaccharides.

In conclusion, ginseng is a traditional herbal medicine used to improve physical and mental health in Asian and Western countries. Recently, ginseng utilization has rapidly expanded into cosmetic fields for skincare and skin health for various purposes, including whitening

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Research Article

## Effect of red ginseng NaturalGEL on skin aging

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Red ginseng NaturalGEL  
Skin hydration

### ABSTRACT

**Background:** In aged skin, degradation of collagen fibers, which occupy the majority of the extracellular matrix in the dermis, and changes of aquaporin 3 (AQP3) and skin constituents, such as hyaluronic acid and ceramide, cause wrinkles and decrease skin moisturization to contribute to dryness and lower elasticity skin. Red ginseng (RG) is used as a cosmetic and food material and is known to protect from UVB-induced cell death, increase skin hydration, prevent wrinkles, and have an antioxidative effect. But, in general, RG used as a material is the soluble liquid portion in the solvent, and the part that is not soluble in the solvent is discarded. Thus, we made the whole RG into microgranulation and dispersed in water to produce gel form for using entire RG, and it was named red ginseng NaturalGEL (RG NGEL).

**Methods:** RG NGEL was investigated for matrix metalloproteinases inhibitory activity, induction of Type I collagen, AQP3, hyaluronan synthetase 2, serine palmitoyl transferase, ceramide synthase 3, and filaggrin expression and compared with RG water extract.

**Results:** RG NGEL reduced the levels of UV-induced matrix metalloproteinases and increased Type I collagen in human fibroblast cells and upregulated AQP3, hyaluronan synthetase 2, serine palmitoyl transferase, ceramide synthase 3, and filaggrin expressions in human keratinocytes compared with RG water extract.

**Conclusion:** RG NGEL has the potential as an effective reagent for antiaging cosmetics to improve wrinkle formation and skin hydration.

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### 4. Discussion

Most RGs are extracted or concentrated using a solvent such as water or ethanol and then used as a material for the product [20]. Because RG is only used by dissolving in solvents, a portion that is not soluble in water is abandoned in large quantities, which causes environmental pollution. However, the discarded part is known to have antioxidant and antiwrinkle effects. To utilize the whole RG, we made the entire RG into microgranulation and dispersed in water to make gel form. It has been reported that ginsenosides contained in RG were effective in collagen production, inhibition of MMP-1 activity, protection against UVB-induced cell death, improvement of skin hydration, and antioxidation [15–19]. We focused on the effect of RG NGEL on skin aging in this study by using measurement of wrinkle formation-related factors, Col-I, and MMPs in human fibroblast cells and investigating to maintain skin moisture. UV irradiation increases MMPs, MMP-1, MMP-2, and MMP-9, followed by degradation of collagen [4,23]. RG NGEL increased the mRNA level of Col-I, but not RG WE (Fig. 2), and significantly inhibited UV-induced MMP-1, MMP-2, and MMP-9 expression compared with RG WE (Fig. 3). In addition, RG NGEL suppressed the activity of MMP-2 and MMP-9 compared with UV irradiation (Fig. 4).

In the present study, the active compounds showing the effect of RG NGEL could not be identified. However, we found that RG NGEL showed wrinkle and elasticity improvement and moisturizing effect even without ginsenosides. Therefore, further investigations are required to clarify components structure and active ingredients contained in RG NGEL.

In conclusion, RG NGEL reduced wrinkle formation by increasing Col-I, a main form in human skin and a predominant constituent of ECM proteins, and suppression of MMP-1, MMP-2 and MMP-9 expression to cause collagen or elastin degradation. And, further RG NGEL increased the levels of AQP3 and HAS2 associated with skin hydration. In addition, RG NGEL promoted the expression of SPT, CERS3, and FLG, which are important for skin moisturization, thereby enhancing skin barrier and preventing water loss compared with RG WE. Therefore, we suggest that RG NGEL can be used as a cosmetic reagent to help prevent skin aging effectively.



# 3 Exosome + NAD<sup>+</sup> & NMN + PDRN + Collagen & Peptides

NAD<sup>+</sup> EXO PN  
EXOSOMES [GINSENG, CICA, CAMELLIA]  
NAD<sup>+</sup> / NMN / PN

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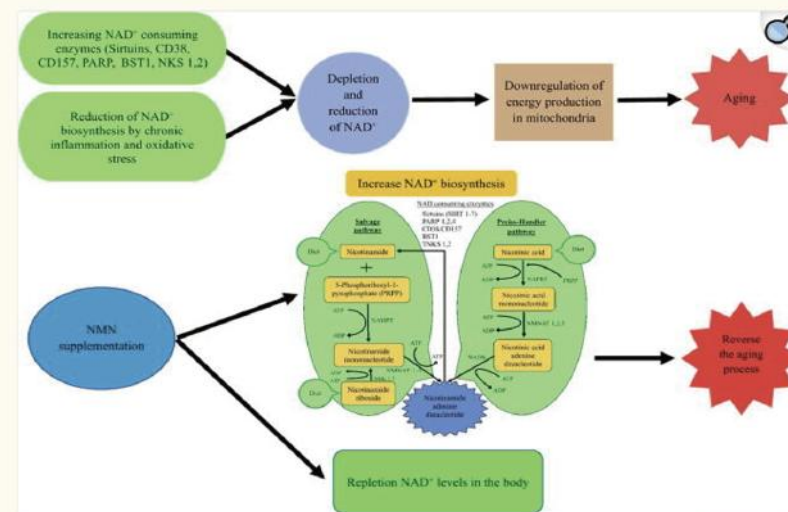
### Nicotinamide mononucleotide (NMN) as an anti-aging health product – Promises and safety concerns

Harshani Nadeeshani<sup>a</sup>, Jinyao Li<sup>b</sup>, Tianlei Ying<sup>c</sup>, Baohong Zhang<sup>d</sup>, Jun Lu<sup>a,e,f,g,h,i,j,\*</sup>

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#### Graphical abstract



[Open in a new tab](#)

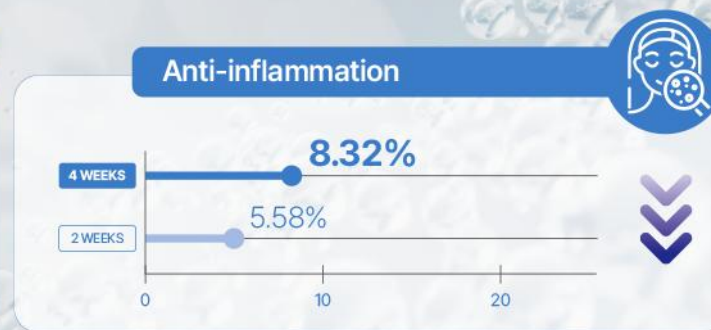
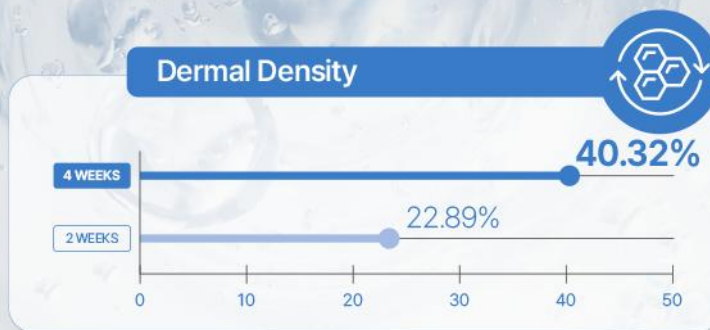
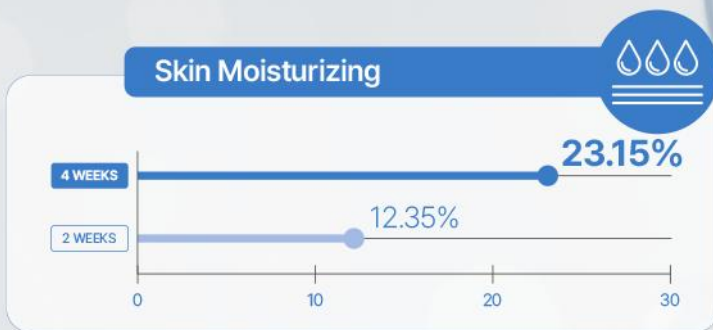
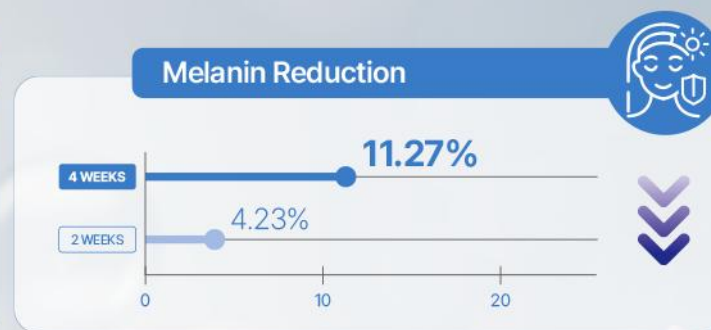
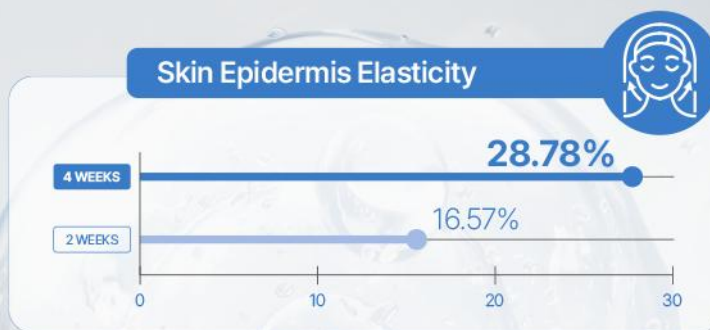
**Keywords:** Age-induced diseases, Anti-aging, Nicotinamide adenine dinucleotide, Nicotinamide mononucleotide, Supplement



# Rate of change by test item

Evaluation Improvement Rate

NAD+ EXO PN  
EXOSOMES [GINSENG, CICA, CAMELLIA]  
NAD+ / NMN / PN





## How to use

NAD<sup>+</sup> EXO PN  
EXOSOMES [GINSENG, CICA, CAMELLIA]  
NAD<sup>+</sup> / NMN / PN



Only for topical application. Daily use at home.

1. Clean the skin.
2. Open the aluminum cap and remove the rubber stopper from both ampoules.
3. Pour the "PDRN Solvent Ampoule 2" into "EXOSOME Ampoule 1".
4. Shake well to completely dissolve the freeze-dried exosome in Ampoule 1.
5. Apply the serum to the face and neck, allowing it to be absorbed.
6. Once absorbed, apply a moisturizing cream.

※ Rubber cones are enclosed in the box.



## NAD<sup>+</sup> EXO PN

EXOSOMES [GINSENG, CICA, CAMELLIA]  
NAD<sup>+</sup> / NMN / PN

