KOSDAQ
코스닥상장법인

ScalpON

Hair follicles care
Hair Growth



BIO-FD&C

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Peptide Synthesis Technology

BIO-FD&C



* The provided image is a conceptual representation

Biomimetic Peptide

- Peptides represent the minimal functional units of proteins.
- Depending on the unique combinations of amino acids, peptides showcase a diverse array of physiological activities.
- By activating essential components within skin cells, peptides promote skin regeneration and reduce aging.

Process of Peptide Synthesis

Weighing/Synthesis



Utilize solid-phase synthesis to create the unique amino acid sequence.

Purification/ Characterization



Employ HPLC purification and analytical techniques to achieve peptide purity of over 95%.

Freeze-Drying



The purified peptide is freeze-dried for 48 hours.

Customization



The freeze-dried peptide is customized into the final product to meet customer specifications.

Quality Inspection



Conducting rigorous quality inspections in accordance with international GMP standards, encompassing pH, microbial, and heavy metal testing.

Dispatch



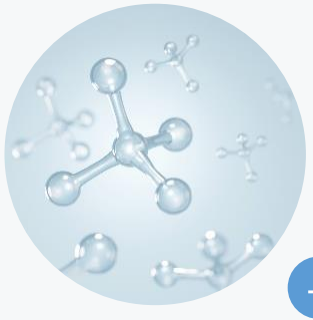
Arrange for product shipment once packing is completed.

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Distinctiveness of BIO-FD&C's Peptides: PhytoPeptide technology

BIO-FD&C

- PhytoPeptide technology is BIO-FD&C's distinctive peptide synthesis technique that combines plant-derived bioactive compounds(phytochemicals) with peptides.



Conventional Peptides

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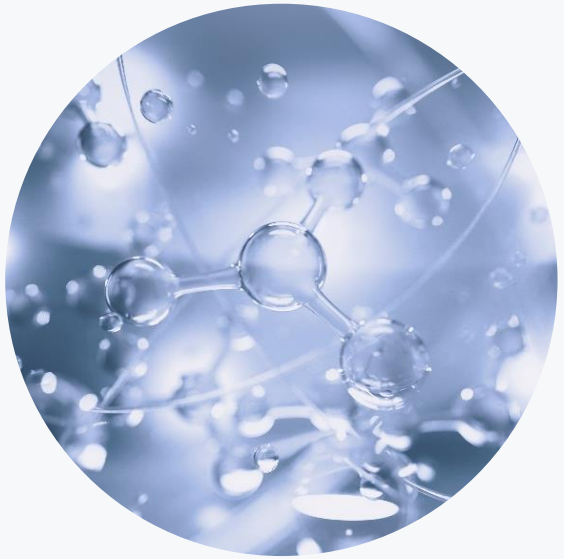
BIO-FD&C's Peptide Synthesis Technique

+



Phytochemicals

Phyto-Peptide Technology



PhytoPeptide

- BIO-FD&C can develop a wide range of peptide combinations and products using hundreds of phytochemicals and peptides with skin physiological activities.
- BIO-FD&C's peptides demonstrate excellent skin absorption and stability as cosmetic ingredients.

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Material Details

ScalpON is a fusion peptide derived from the reaction of Biotin and Pentapeptide-73.

- **Biotin**, a water-soluble form of Vitamin B, is abundantly found in eggs, milk, and bananas. Widely used in the haircare/cosmetic market, it improves hair condition and addresses hair loss symptoms, commonly found in shampoos and health supplements.
- **Pentapeptide-73** exhibits immunomodulatory properties, interacting with T cells (immune cells). Combined with hormone replacement therapy, it effectively alleviates hair loss, particularly in androgenetic alopecia. Additionally, it serves as an improvement agent for atopic dermatitis, a skin disorder related to immune response.

ScalpON offers exceptional scalp care, enhancing hair growth (thickness, length), hair due to a loss of pigmentation.

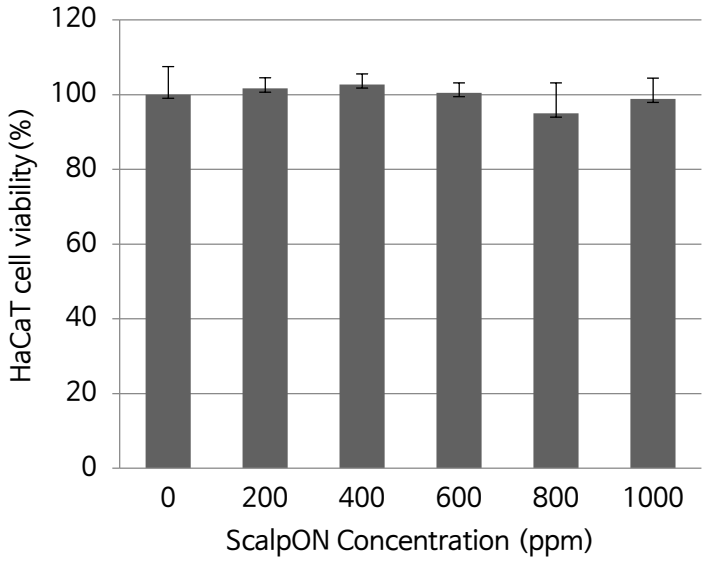
Trade name	ScalpON
INCI name	Biotinoyl Pentapeptide-73
Purity	>95%
Product type	Solution
MOQ	100ppm, 1kg
Recommend dosage	>10ppm
Effect	Hair follicles care/Hair Growth/Hair pigmentation

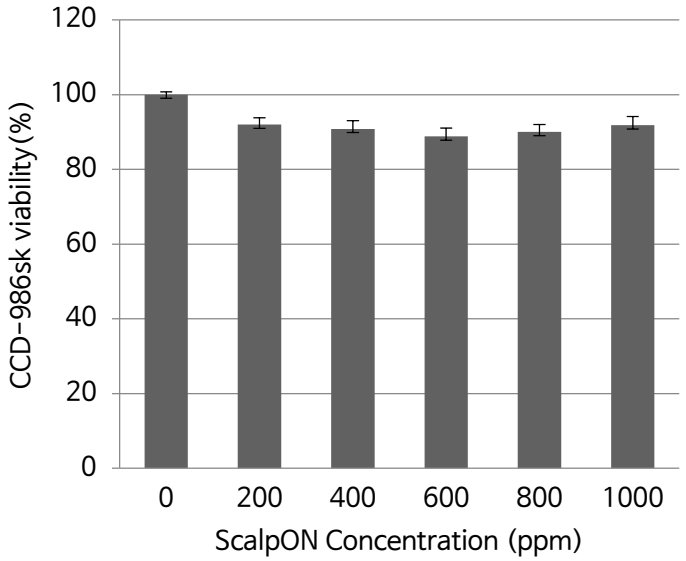
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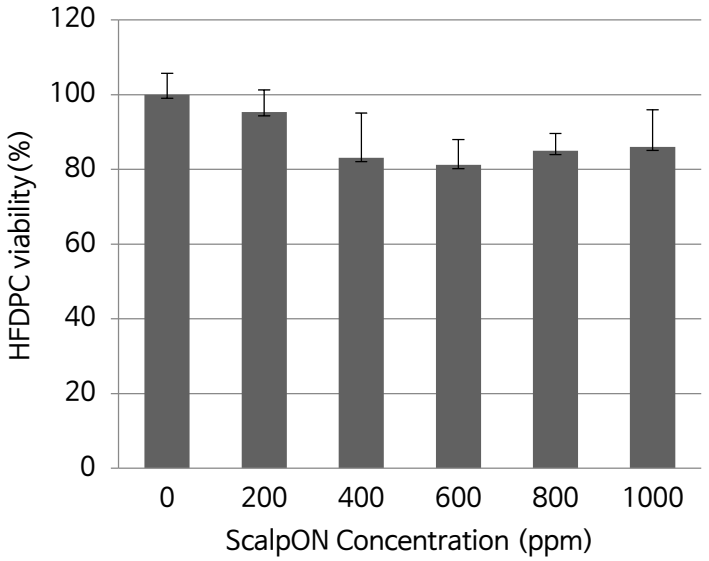
Cell Viability (Non-Toxicity)

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ScalpON

- ScalpON exhibits safety by showing no cell toxicity (less than 80% cell viability) across all concentrations.
- Even at a high concentration of 1000ppm or more, ScalpON is proven safe when applied to HFDPC (Human Follicle Dermal Papilla Cells), allowing for prolonged use on the scalp.







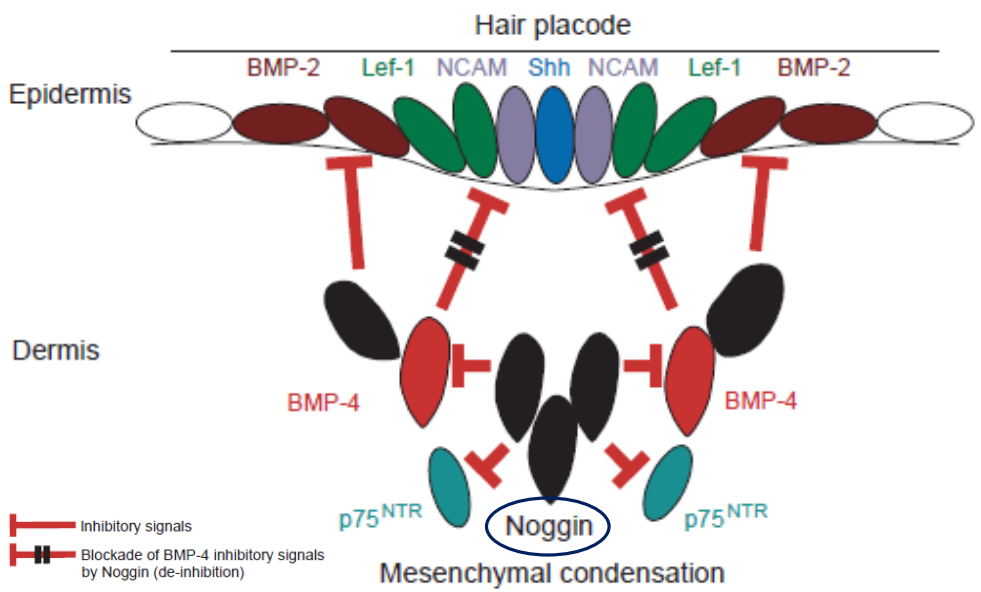
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Stimulation of Hair Growth (Noggin, Wnt)

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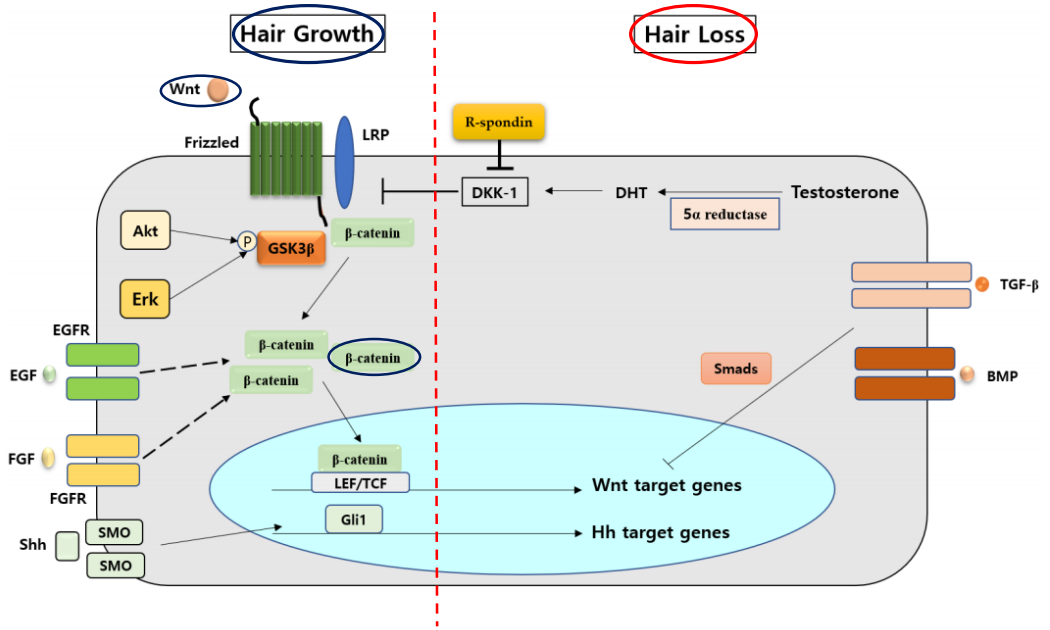
Noggin induced proliferation of hair follicles



*Noggin : Promotes the differentiation of hair follicle progenitor cells, inhibits the destruction of hair follicle cells through the regulation of BMP-2/4 signaling, and activates the Wnt/β-catenin pathway to enhance the proliferation and differentiation of hair follicles, playing a role in hair growth.

Ref. Nat Cell Biol 1, 158–164 (1999).

Hair Growth/Loss pathway



* Wnt: An activator of β-catenin, it promotes the formation and differentiation of hair follicles, contributing to hair growth.

Ref. Shin, 2022, Life, 12, 1856

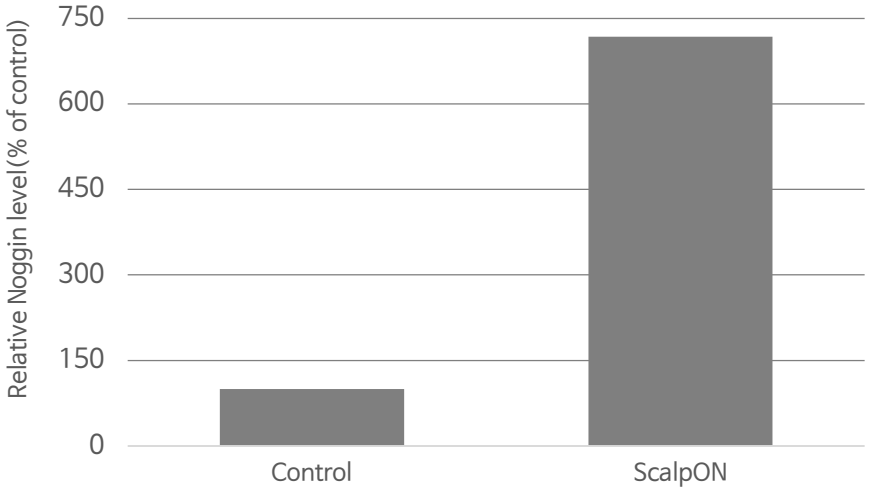
- Increased levels of Noggin and Wnt synergize to stimulate hair follicle development and proliferation, leading to more effective hair regrowth.

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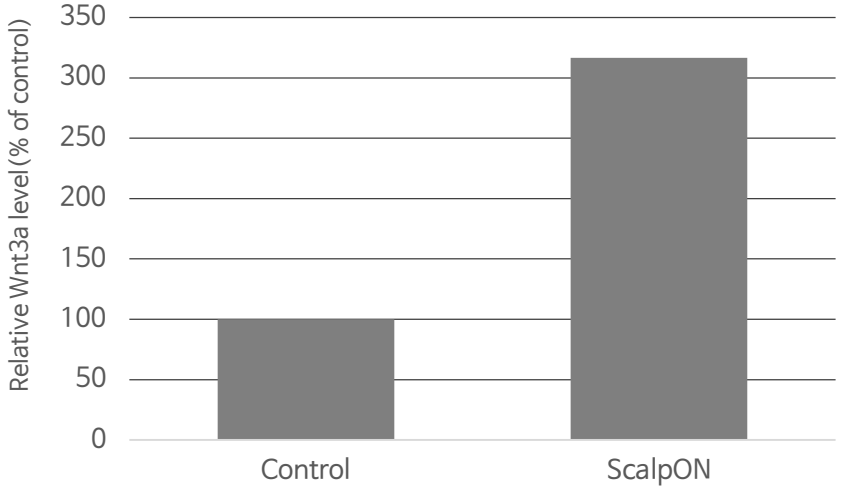
Increase in elements for Hair Growth (Noggin, Wnt3a)

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- Treatment with ScalpON notably enhances the mRNA expressions of Noggin and Wnt3a, key elements in hair growth
- There's a significant increase in Noggin and Wnt3a expression, reaching approximately 720% and 320%, respectively.
- These results indicate that it promotes hair growth.



	Measuring the increase in Noggin mRNA expression	
mRNA Expression		
Treated Ingredient	control	ScalpON



	Measuring the increase in Wnt3a mRNA expression	
mRNA Expression		
Treated Ingredient	control	ScalpON

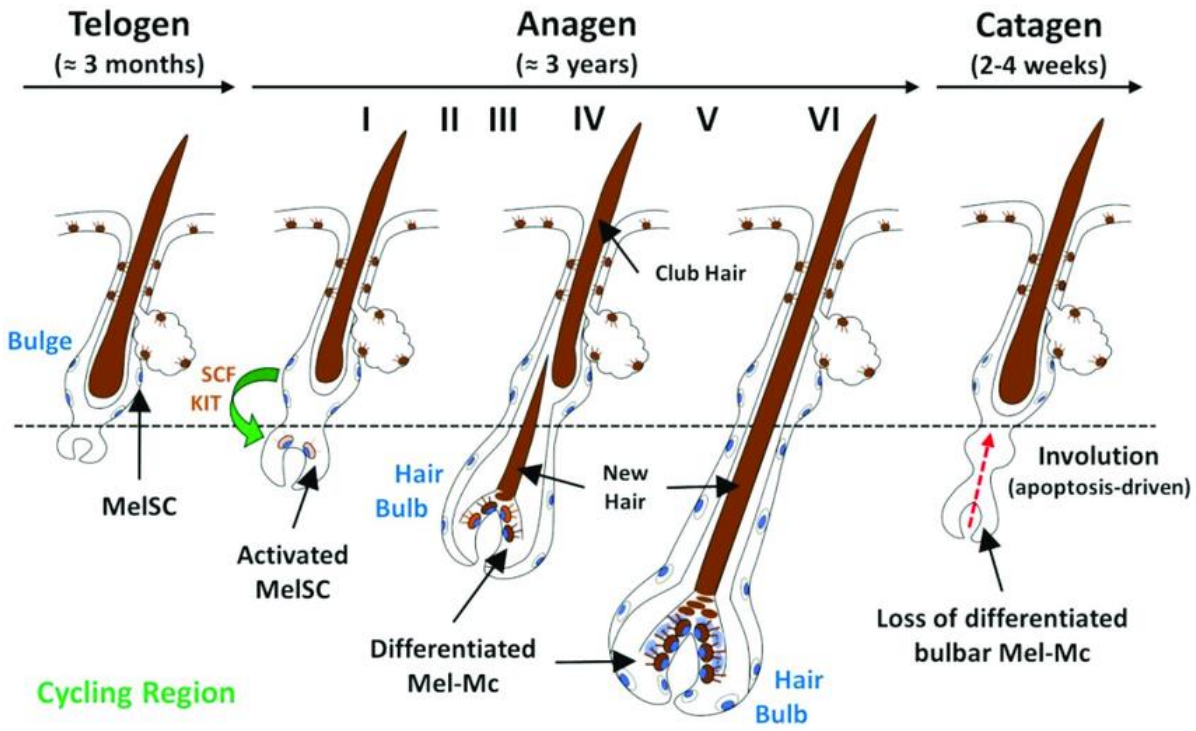
Ref. BIO-FD&C Medicinal Nanomaterial Institute

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Melanogenesis for Hair Growth

Simulation of Hair Bulb Development and Stabilization of Hair Growth

- Melanocytes play a crucial role in hair growth by undergoing various stages of activation, proliferation, and differentiation during the anagen phase.
- This leads to effective melanin synthesis, crucial for hair growth and pigmentation.



- Melanocyte Activation: At the beginning of anagen, immature melanocytes are stimulated. They respond by increasing their volume, entering mitotic activity, and migrating to repopulate the bulb of the newly forming hair follicle.
- Melanocyte Proliferation: By anagen II, melanocytes begin to proliferate, a process that becomes significant at anagen III and continues until anagen VI.
- Melanosomal Development and Dendricity: At the anagen phase progresses, melanocytes increase the size and number of their melanosomes and become highly dendritic.
- Melanin Synthesis: At anagen VI, as proliferation ceases, bulbar melanocytes reach a highly differentiated status and become fully functional regarding melanin synthesis.

Ref. Biology 2023, 12(2), 290

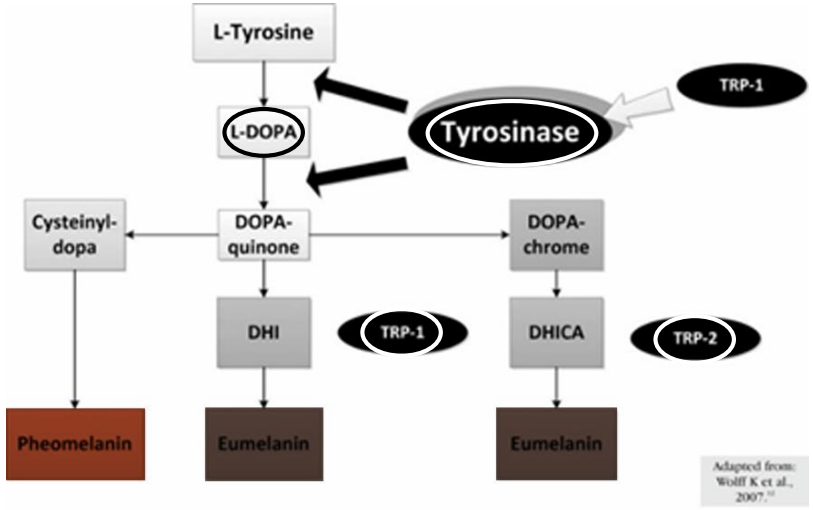
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Melanogenesis for Hair Growth

Simulation of Hair Bulb Development and Stabilization of Hair Growth

- Stimulating melanin synthesis in the scalp and hair influences hair growth and pigmentation.
- Tyrosinase's role as the initial catalyst makes it particularly crucial, while L-DOPA, TRP-1, and TRP-2 further facilitate and stabilize the process, ensuring efficient melanin production.

Melanogenesis pathway



- Tyrosinase: A key enzyme in melanin synthesis. It catalyzes the first step, converting L-tyrosine to L-DOPA.
- L-DOPA: A product and an intermediate in melanogenesis, acting as a substrate for further reactions leading to melanin production.
- TRP-1: This protein plays a role in stabilizing tyrosinase, supporting melanosome synthesis, and protecting against oxidative stress.
- TRP-2: It functions as a dopachrome tautomerase, participating in the melanin synthesis pathway.

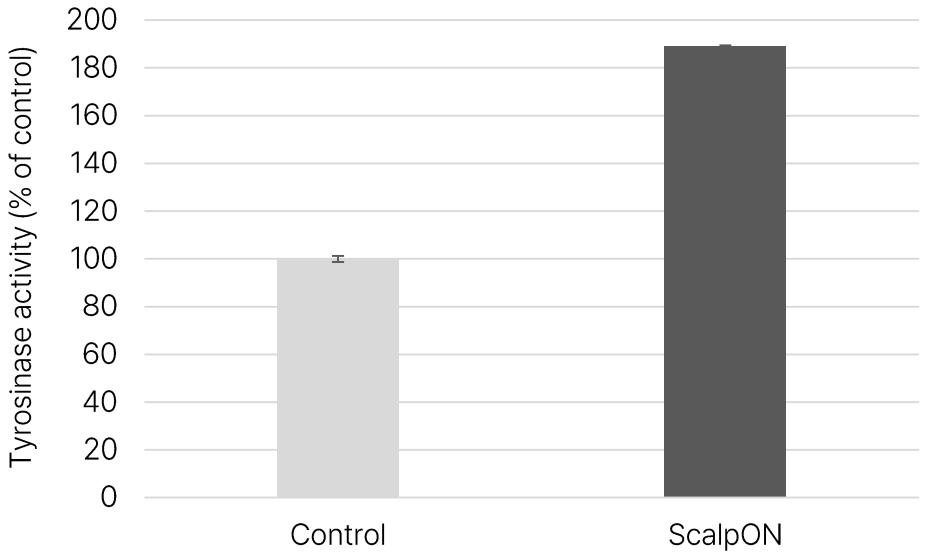
Ref. An Bras Dermatol. 2013;88(1):76-83

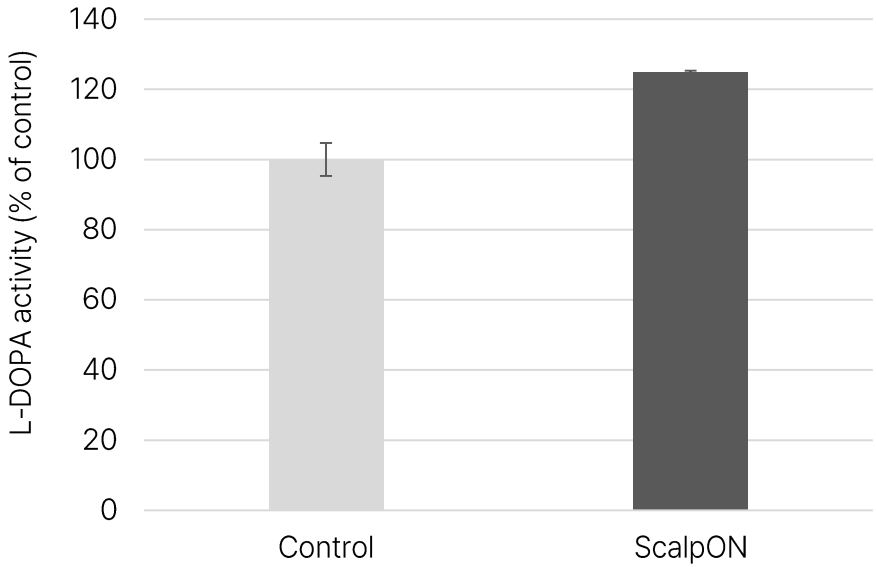
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Enhanced Melanin Activation (Tyrosine, L-DOPA)

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- In the ScalpON-treated group, there's a significant boost in the activity of factors that promote melanin synthesis.
- The activities of Tyrosine and L-DOPA are notably increased by approximately 190% and 120%, respectively.
- This heightened activity of melanin synthesis factors leads to anticipated anti-aging effects in hair, primarily through stimulated hair bulb formation and stabilized hair growth.





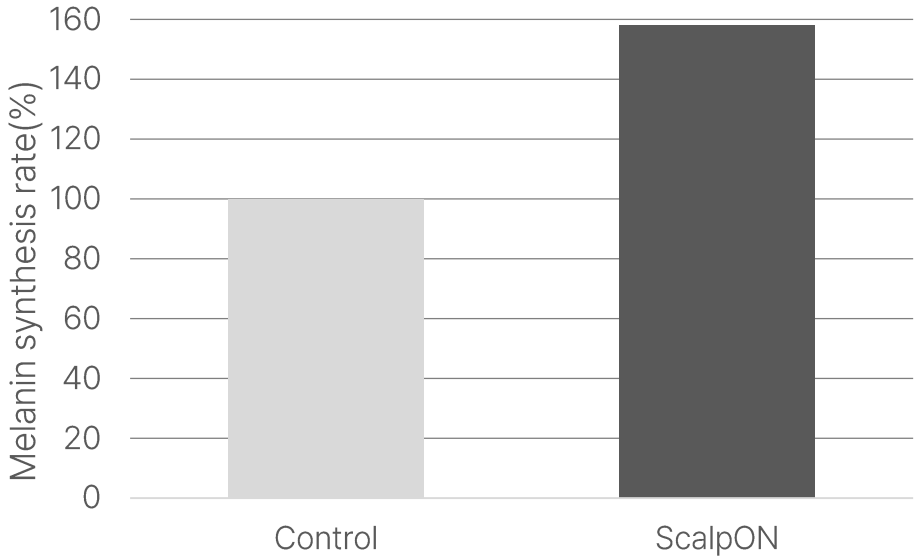
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Boosted Melanin Biosynthesis

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- Our comprehensive assessment of melanin biosynthesis demonstrated up to a 158% increase in the ScalpON-treated group.
- This surge in melanin biosynthesis leads to the development of hair bulbs and the stabilization of the hair growth cycle.



	Measuring the increase of melanin biosynthesis	
Melanocyte		
Treated Ingredient	Control	ScalpON

Ref. BIO-FD&C Medicinal Nanomaterial Institute

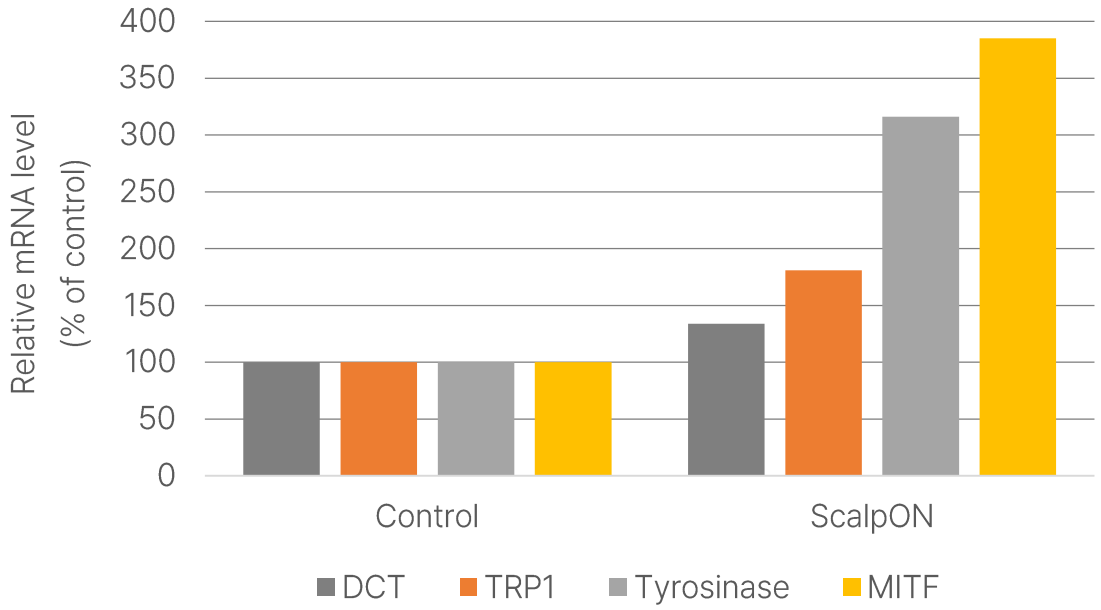
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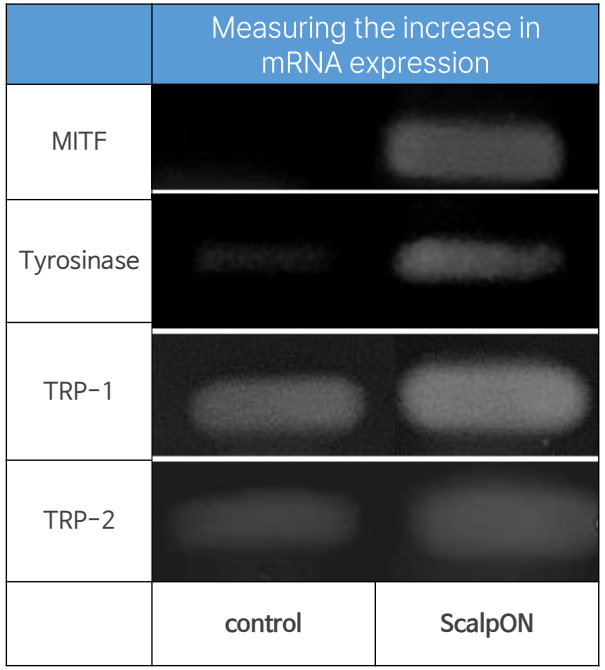
Boosted Melanin Biosynthesis

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Increase in mRNA expression

- To test the effect of ScalpON on melanin biosynthesis, the mRNA expression levels of elements involved in melanin synthesis were measured.
- In the ScalpON treated group, the expression levels of all factors increased compared to the untreated group.
- The mRNA expression levels of each factor showed an increase of 314.8% for MITF, 316.49% for tyrosinase, 181.19% for TRP-1, and 134.24% for DCT.





* MITF(Microphthalmia-associated Transcription Factor): MITF acts as a master controller for the expression of key melanogenic enzymes and proteins.
* DCT(Dopachrome Tautomerase): DCT, also known as TRP-2, is an enzyme involved in melanin synthesis.

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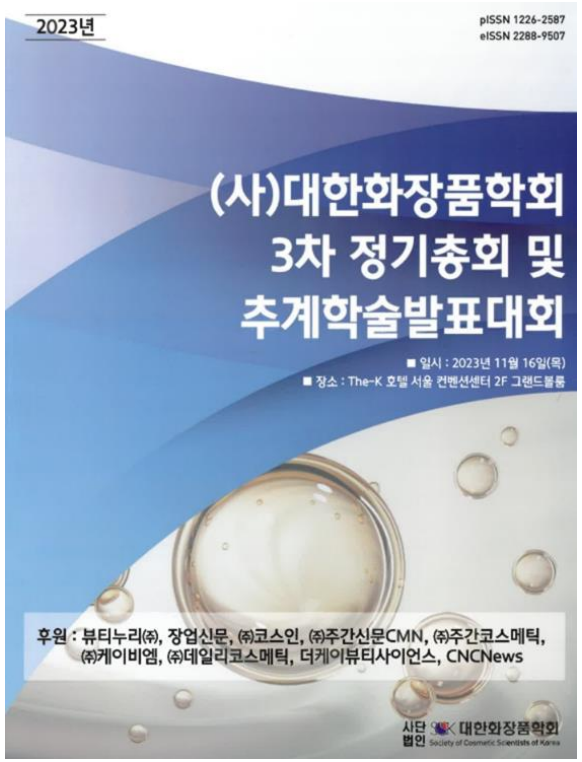
<ScalpON Domestic Patent Application>

2023-11-07

【서지사항】

【서류명】	특허출원서
【출원구분】	특허출원
【출원인】	
【명칭】	주식회사 바이오에프디엔씨
【특허고객번호】	1-2005-045499-1
【대리인】	
【명칭】	특허법인(유)화우
【대리인번호】	9-2006-100002-2
【지정된변리사】	변영철, 배지현
【포괄위임등록번호】	2016-010110-0
【발명의 국문명칭】	펜타펩타이드와 비오틴이 결합된 융합 펩타이드를 함유하는 탈모 예방, 개선 또는 치료용, 또는 발모 또는 육모 촉진용 조성물
【발명의 영문명칭】	Composition for preventing, improving, or treating hair loss, or for promoting hair growth, containing a fusion peptide in which a pentapeptide and biotin are combined

<ScalpON Academic Conference Presentation>





소재 73

A Novel Conjugated Peptide Derivative that Prevents Hair Loss and Promote Hair Growth

So Jeong Chu†, Seong Sim Kim, Su Jung Kim, and Dai Hyun Jung††
BIO-FD&C, Medicinal Nanomaterial Institute

In this study, we aimed to develop a novel phytochemical-peptide derivative with the potential to promote hair growth. The synthesized peptide, designated as ScalpON, was obtained through solid-phase peptide synthesis (SPSS). We conducted an efficacy assessment of ScalpON to evaluate its suitability as a novel cosmetic hair care ingredient for scalp treatment. Cell viability was assessed using MTT on human keratinocytes, human fibroblast, and human follicle dermal papilla cells (HFDPC). To investigate its impact on hair growth, we evaluated the mRNA expressions of noggin and wnt3a via reverse transcription-polymerase chain reaction (RT-PCR). Notably, both noggin and wnt3a genes were significantly up-regulated in response to ScalpOn treatment in HFDPCs, showing a remarkable increase of 717% and 316%, respectively, compared to the negative control. These findings suggested that ScalpON holds promise as a cosmetic material for not only preventing hair loss but also promoting hair regrowth, particularly in cases of alopecia.

Keywords: phytochemical-peptide derivatives, hair growth, hair loss, wnt/β-catenin pathways

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[Important Notice]
The descriptions and terminology in this marketing material are intended for information purposes regarding our ingredients.

※ All raw ingredients produced and supplied by BIO-FD&C Co., Ltd. Are exclusively for use in cosmetic manufacturing.

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