Product for hair growth, anti-microbial, anti-photoaging effects

BotaCair

Oriental herbal product for hair and scalp care

the garden of naturalsolution
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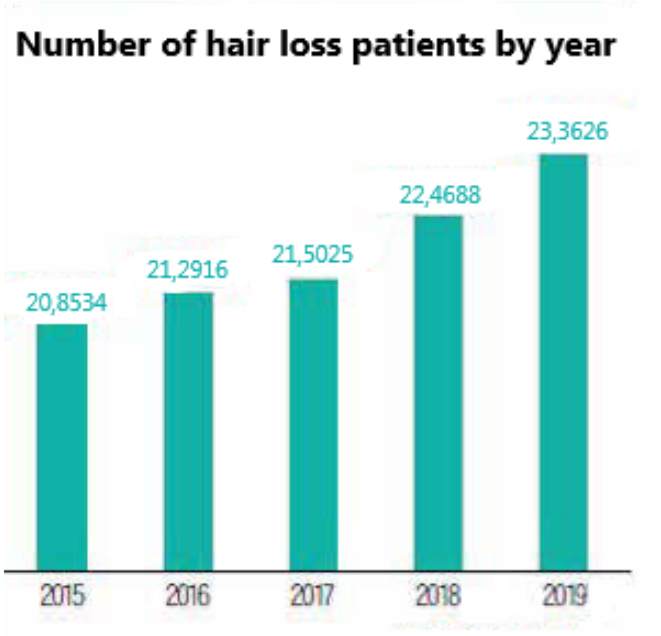
Increased Concerns on Hair Loss

According to a survey by the Korean National Health Insurance Corporation, the number of hair loss patients is increasing year by year. According to the survey, people between the ages of 40 to 60 are the consumer group who buy hair loss shampoo the most, and the purchase rate of the younger generation between the ages of 25 to 34 is also increasing. As the hair loss population increases, the market for hair care products is growing rapidly, and the importance of functional hair loss products is also increasing.



Reference: National interest disease statistics - alopecia / Healthcare Bigdata Hub

Factors of Hair Loss

Hair loss refers to the loss of thick and black terminal hair of the scalp, and it occurs when new hair doesn't replace the hair that has fallen out. Hair loss is caused by many factors such as genetic factors, stress, lifestyle habits, or improperly managed scalp. Hair loss can also be caused by environmental pollution.

Hereditary Condition

It is the most common cause of hair loss. It usually occurs gradually and in predictable patterns.

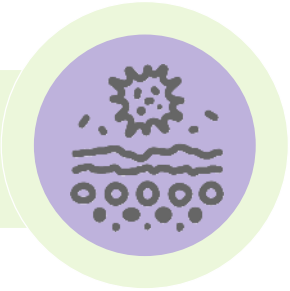
Medications and Supplements

Hair loss can be a side effect of certain drugs, such as those used for cancer, arthritis, heart diseases and high blood pressure.

Heavily Pulled Hairstyle

Excessive hairstyles that pull hair tight, such as pigtails or tight ponytails, can cause a type of hair loss called traction alopecia.

Environmental Pollution

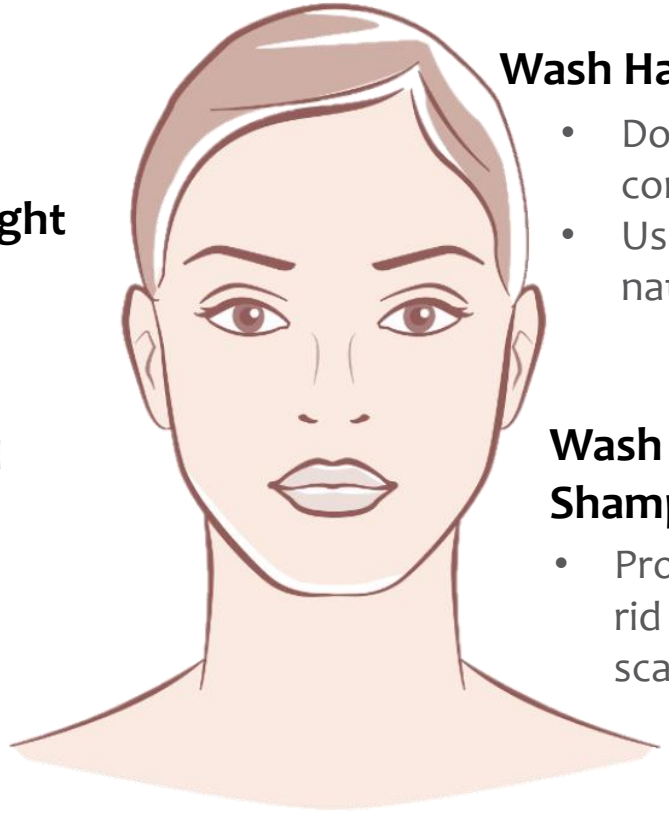


Studies have shown that the PM10-like dust and diesel particulates lowered levels of a protein key to hair growth.

Methods of Preventing Hair Loss

Protect Hair from Sunlight and UV

- Excessive amounts of ultraviolet light can damage the scalp and cause hair loss



Wash Hair with a Mild Shampoo

- Don’t use shampoo containing harsh ingredients
- Use shampoo made of natural ingredients

Wash with an Anti-microbial Shampoo

- Protect follicles by getting rid of the bacteria from the scalp

Functional Shampoo for Hair Care

AVEDA

Cherry Almond softening shampoo

- Naturally derived cherry blossom and sweet almond oil restore softness and shine from roots to ends, leaving hair feeling soft
- **Made of babassu and coconut-derived ingredients, effectively cleanses hair without stripping the scalp's natural lipids**

Function of Beauty

Wavy Hair Shampoo Base with Fermented Rice Water

- Suitable for sensitive skin, and derma tested
- **Strengthens hair and increases hair elasticity with fermented rice water**

Function of Beauty

Lengthen #Hairgoal Booster Shots

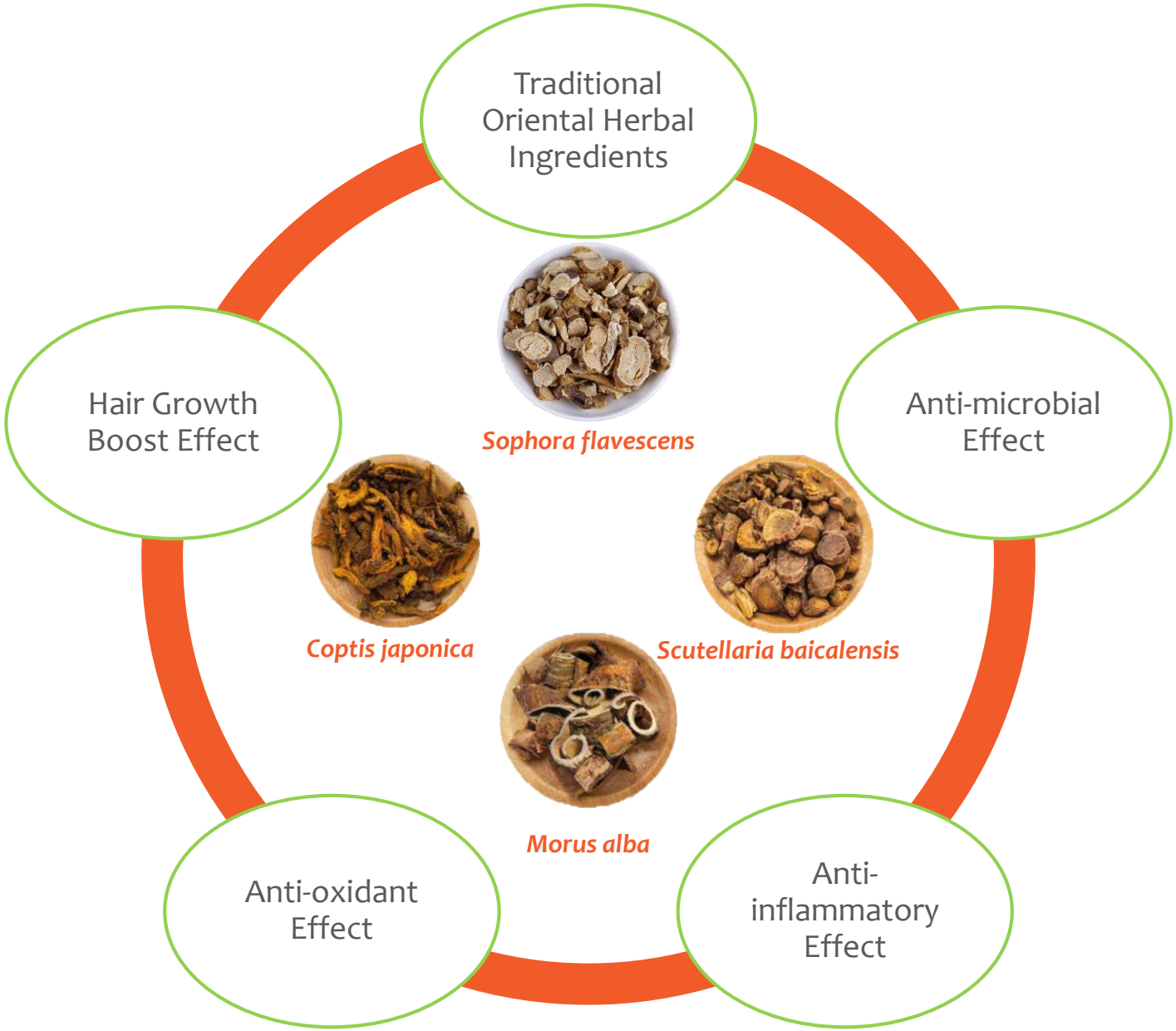
- **A product formulated with hops extract, promotes hair growth for stronger and healthier-looking hair**

BotaCair: A Solution for Hair Loss

BotaCair has been developed as a natural hair care ingredient and is composed of 4 herbs which have strong anti-oxidant and anti-microbial effects. BotaCair is made by an ultrasonic extraction method that maximizes the extraction yield, and stability has been secured through the aging process.

BotaCair has **beneficial effects on both scalp and hair conditions**. It improves the scalp condition with anti-microbial and anti-photoaging effects, while it proliferates the dermal papilla cells, helping to accelerate hair regeneration. BotaCair also improves the expression of genes related to hair growth.

Synergic Effects by Blending Four Medicinal Plants



Ultrasonic Extraction

When a raw material is soaked in an extraction solvent and irradiated with ultrasonic waves, a strong force is applied to the solvent and creates small bubbles. As ultrasonic waves are continuously applied, the bubbles gradually grow and explode, emitting waves with strong energy. The energy of this wave is strong enough to destroy the cell walls of the raw material, so the active ingredient in the raw material can be extracted.
Compared with conventional methods such as high temperature solvent extraction, hazardous smoke is not generated during the extraction process, so it is **non-toxic and pollution-free for workers**. In addition, as relatively low heat is applied, there is almost no denaturation or destruction of active ingredients in raw materials. Ultrasonic extraction also shows **excellent extraction efficiency** as it improves the extractability and extraction speed.

Plant Story: *Sophora flavescens*

The dried root of *Sophora flavescens* is a well known medicinal herb in East Asia used for the treatment of diarrhea, gastrointestinal hemorrhage, eczema, psoriasis and cancer.
S. flavescens contains alkaloids, triterpenoids and flavonoids, which are known to have various biological activities. Matrine and oxymatrine, the main alkaloids extracted from *S. flavescens,* show **anti-oxidant**, **anti-inflammatory** and **anti-tumor** activities. Experimental results also suggest that pterocarpans in the *S. flavescens* extract are effective for the **treatment of androgenetic alopecia**.

Reference: Improvement of androgenetic alopecia with topical *Sophora flavescens* aiton extract, and identification of the two active compounds in the extract that stimulate proliferation of human hair keratinocytes, Takahashi *et al*., Clin Exp Dermatol, 2015, 41(3), p302–307.

Plant Story: *Coptis japonica*

Coptis japonica is distributed in East Asia and cultivated as a medicinal herb. The root of *C. japonica* has been used in traditional oriental medicine because of its multiple pharmacological effects including **anti-microbial**, **anti-oxidant**, **anti-inflammatory**, and **anti-cancer effects**.

The root has long been used to treat gastroenteritis, diarrhea, and severe skin diseases. It was reported that the root of *C. japonica* exhibited **high scavenging activity of reactive oxygen species**. Its root contains lignans and diverse alkaloids including berberine, palmatine, magnoflorine, and coptisine. Among these compounds, berberine has the most notable **anti-inflammatory activity**. There is also a report that coptis glycan has a photoprotective effect against UV-induced oxidative damage to the skin.

Reference: Biological and antifungal activity of herbal plant extracts against *Candida* species, Kim *et al.*, Korean J. Microbial Biotechnol, 2009, 37(1), p.42-48

Plant Story: *Scutellaria baicalensis*

Scutellaria baicalensis is a perennial flowering herb distributed and widely used as a medicinal herb in Asian countries. The root is one of the 50 fundamental herbs used in traditional Chinese medicine. *S. baicalensis* has been used to treat infection, diarrhea, jaundice, and hepatitis.

Many research papers reported various pharmacological properties of *S. baicalensis*, such as **anti-microbial**, **anti-viral**, **anti-hypertensive**, and **anti-tumor activities**. The therapeutic activities of skullcap root are due to the high concentration of flavonoids including baicalin, baicalein, wogonin, and ganhuangenin. Each major flavonoid was investigated to prove its pharmacological effects.

Studies showed that all the major flavonoids exhibited significant **anti-oxidant** and **free radical scavenging activities** while wogonin was superior to all the other flavonoids in anti-inflammatory activity. A recent study also showed the **inhibition activity of baicalein on melanogenesis** through activation of the ERK signaling pathway.

Reference: A wogonin-rich-fraction of *Scutellaria baicalensis* root extract exerts chondroprotective effects by suppressing IL-1β-induced activation of AP-1 in human OA chondrocytes, Khan *et al.*, Sci Rep, 2017, 7(1)

Plant Story: *Morus alba*

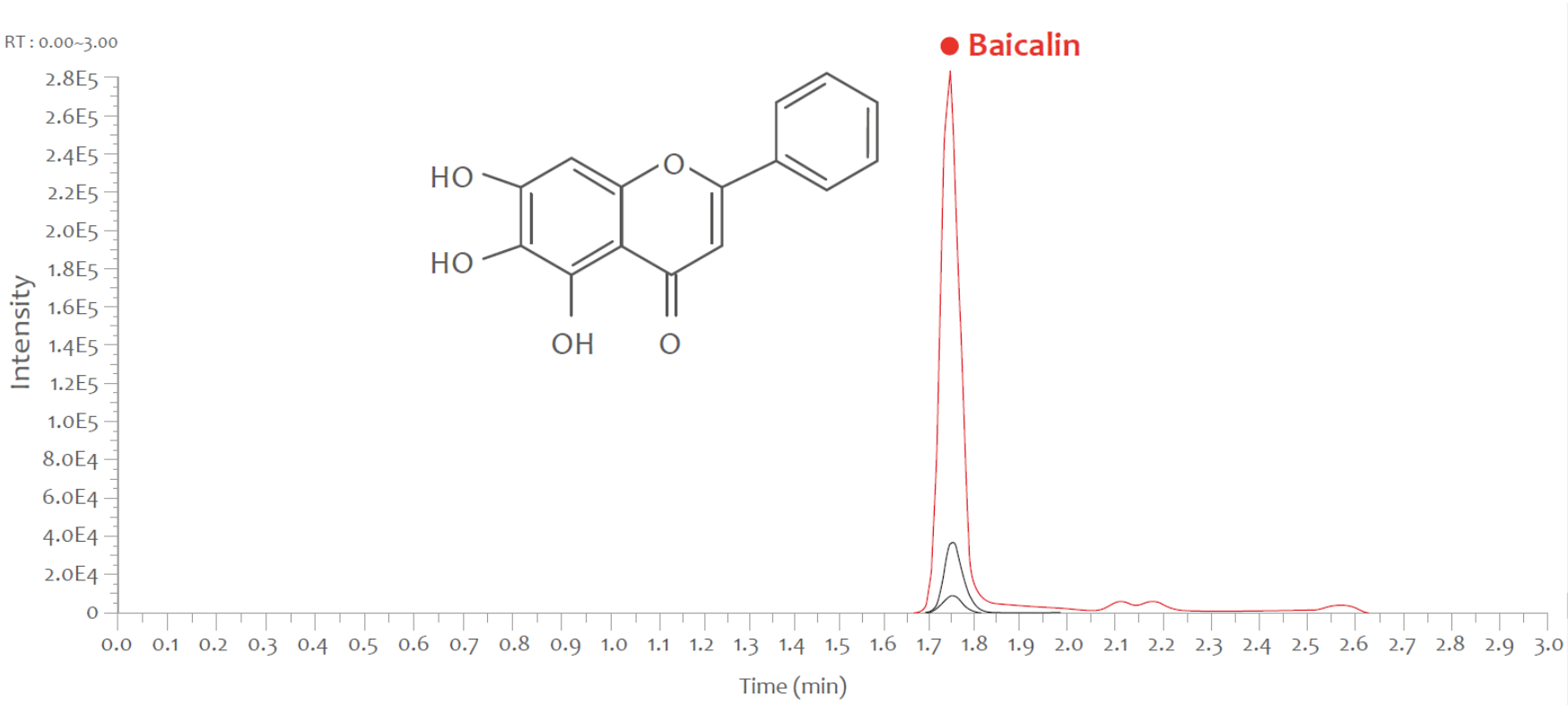
Morus alba, known as white mulberry, is native to northern China, and widely cultivated to feed silkworms throughout the world. In traditional Chinese and Korean medicine, the leaves are taken internally for the treatment of sore throats, colds, eye infections, and nosebleeds. The stems are used in the treatment of spasms, rheumatic pains, and high blood pressure. The fruit is used in the treatment of urinary incontinence, dizziness, diabetes, pre-maturing gray hair, and constipation in the elderly.

Recent scientific studies showed that oxyresveratrol, a component contained in *M. alba,* has an **anti-inflammatory effect** that significantly **inhibits COX-2 activity** in RAW 264.7 cells, suggesting this plant can be used as a natural ingredient for cosmetics.

Reference: *in vitro* and *in vivo* anti-inflammatory effect of oxyresveratrol from *Morus alba* L, Chung *et al*., J Pharm Pharmacol, 2003, 55(12), p1695-1700

Identification of Marker Compound

Baicalin as a Marker Compound



in vitro Efficacy Evaluation

Hair Growth Effect

Increase in VEGF / bFGF / β-catenin Gene Expression

Hair Cell Proliferation in Human Dermal Papilla Cells

Anti-microbial Effect

Staphylococcus aureus Inhibition Activity

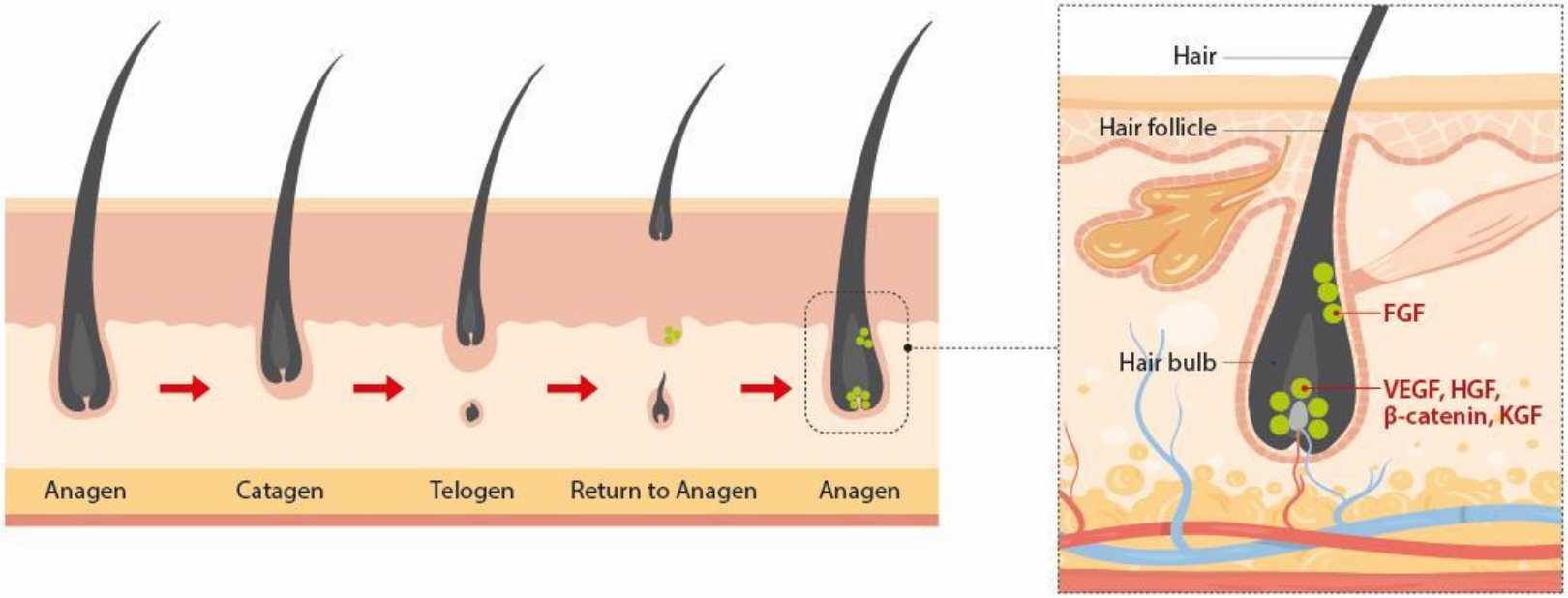
Anti-oxidant Effect

ROS Generation Inhibition Activity

Anti-photoaging Effect

ROS Generation Inhibition Activity after UVB Irradiation

Hair Growth Boost

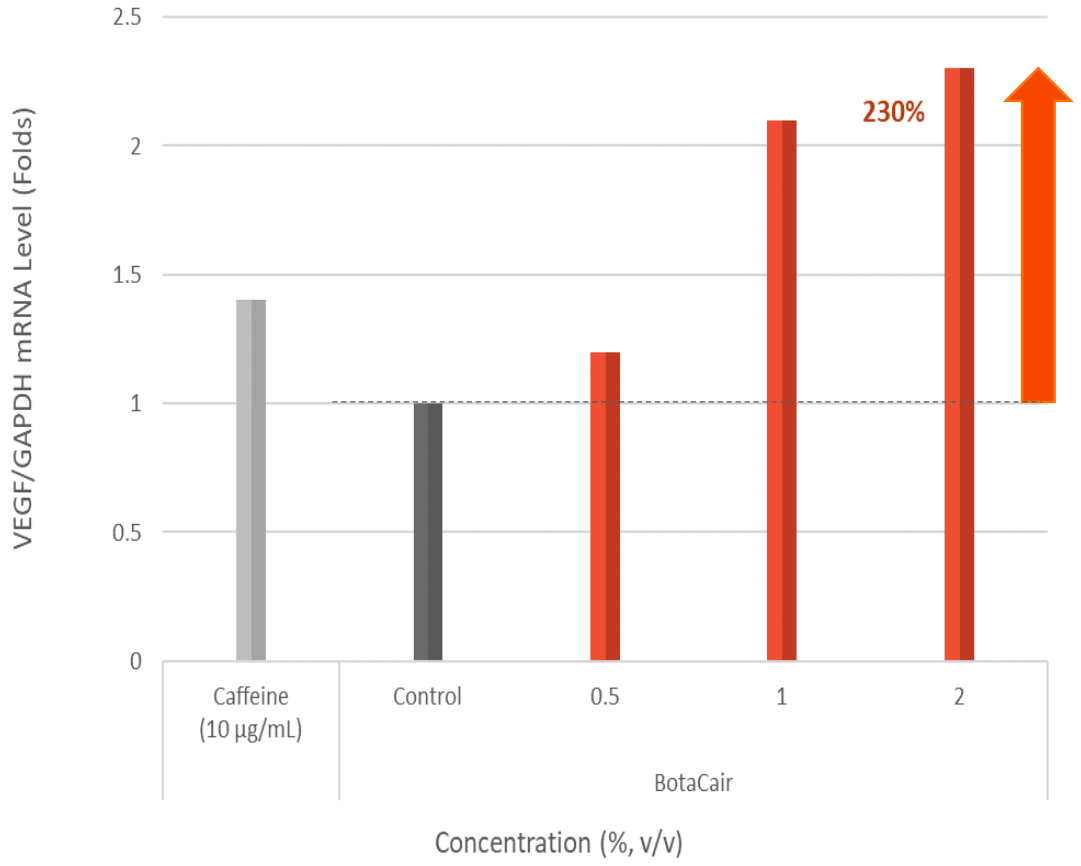


VEGF (vascular endothelial growth factor), bFGF (basic fibroblast growth factor) and β-catenin are the markers of angiogenesis. During the hair growth phase, the growth of new capillaries occurs, and the expression of genes involved in angiogenesis is also promoted. These genes promote hair growth rates, formation of blood vessels around the follicle, and increase follicle size and hair size. So, **upregulating the expression of these genes** in hair dermal papilla cells could **promote hair growth**.

Reference: Control of hair growth and follicle size by VEGF-mediated angiogenesis, Yano *et al*, J Clin Invest, 2001, 107(4) p409-417.

in vitro Efficacy Evaluation: Hair Growth Effect

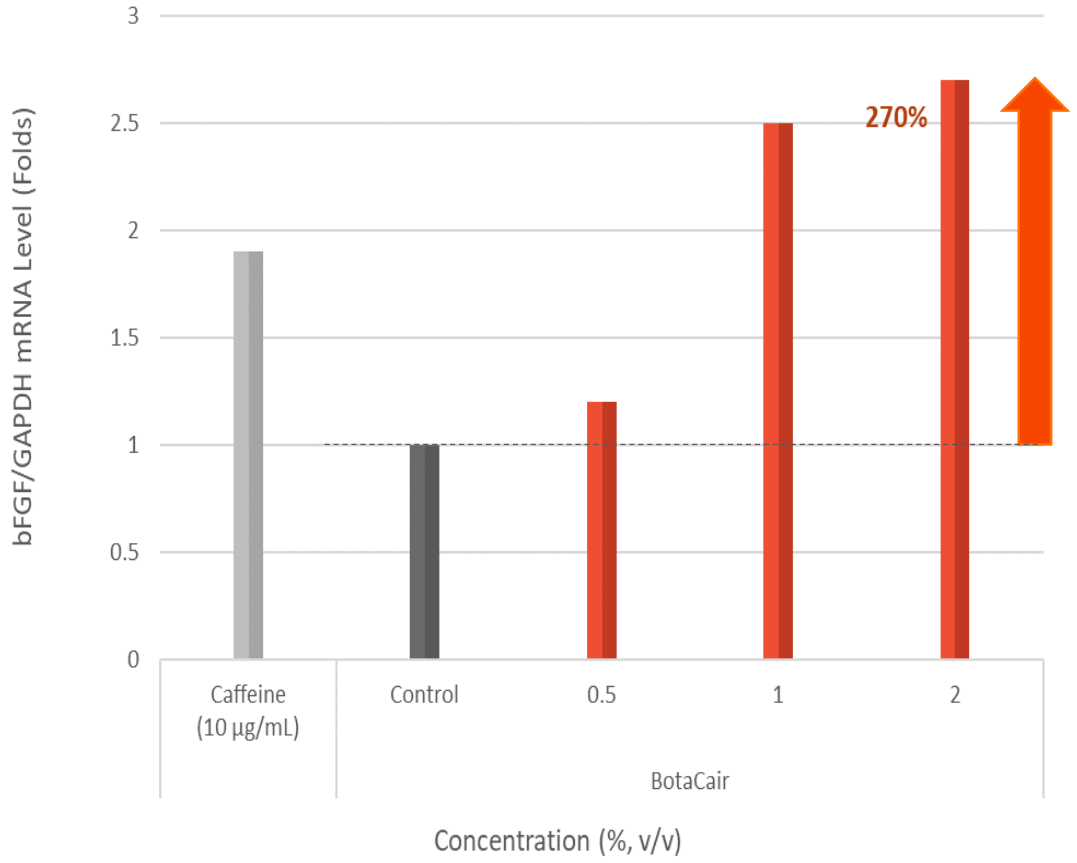
Increase in VEGF Gene Expression



The **hair growth promoting property of BotaCair** is identified by measuring the VEGF gene expression in human dermal papilla cells. As a result, **2% of BotaCair increased the expression of VEGF gene by 230%.**

in vitro Efficacy Evaluation: Hair Growth Effect

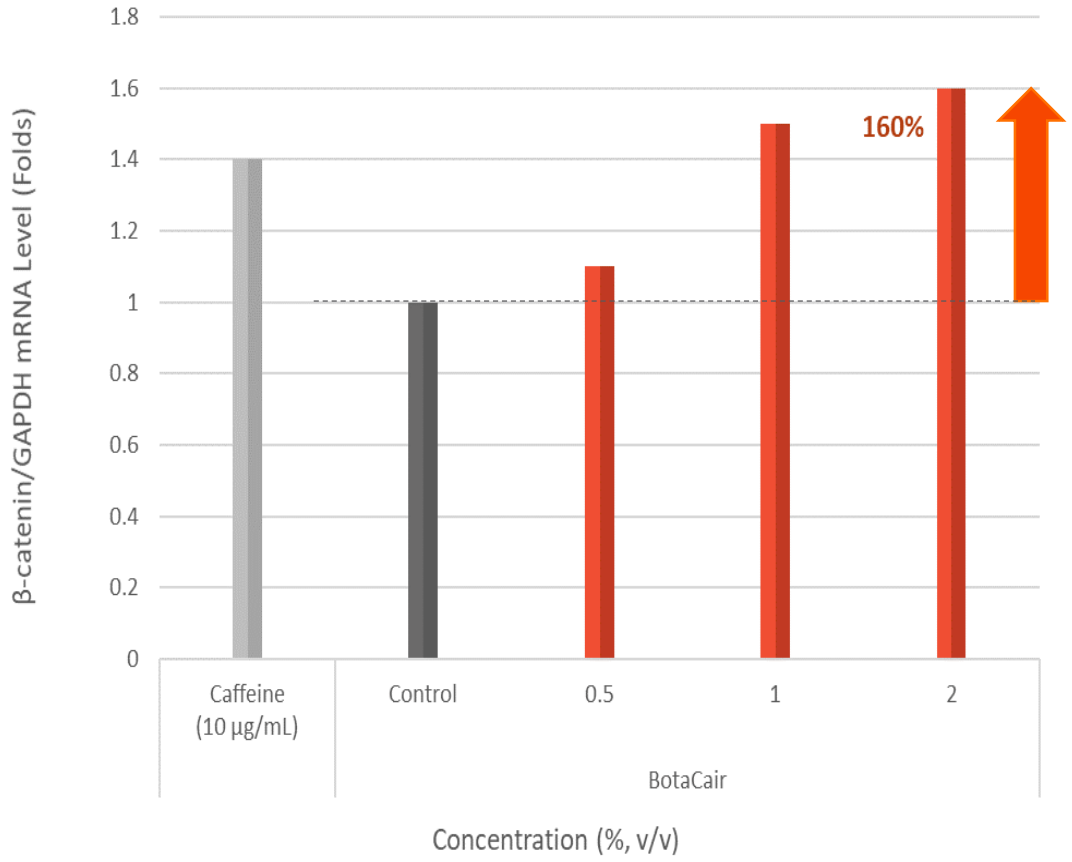
Increase in bFGF Gene Expression



In the test, **2% of BotaCair increased the expression of bFGF gene by 270%.**

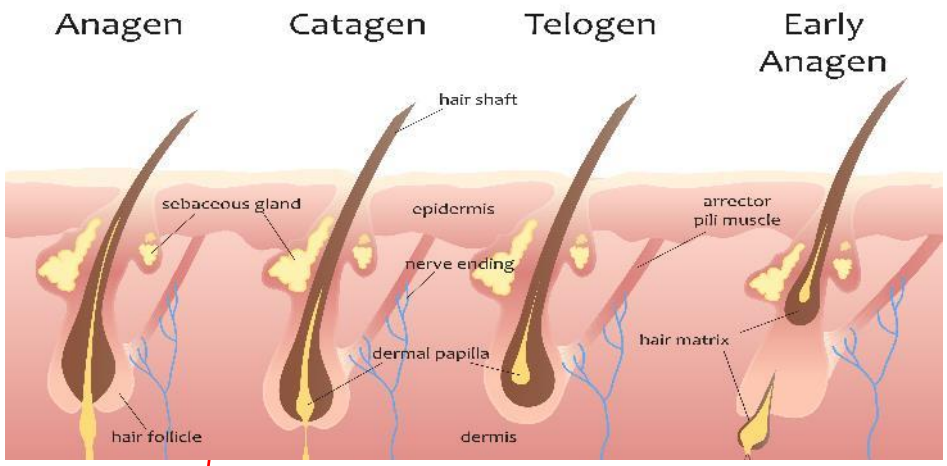
in vitro Efficacy Evaluation: Hair Growth Effect

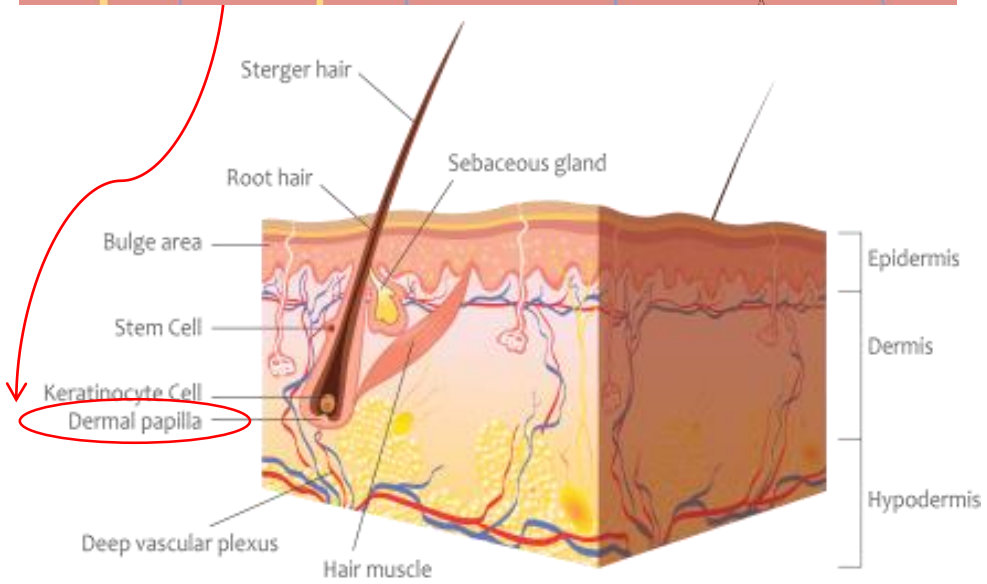
Increase in β-catenin Gene Expression



In the test, **2% of BotaCair increased the expression of β-catenin gene by 160%.**

Hair Growth Cycle





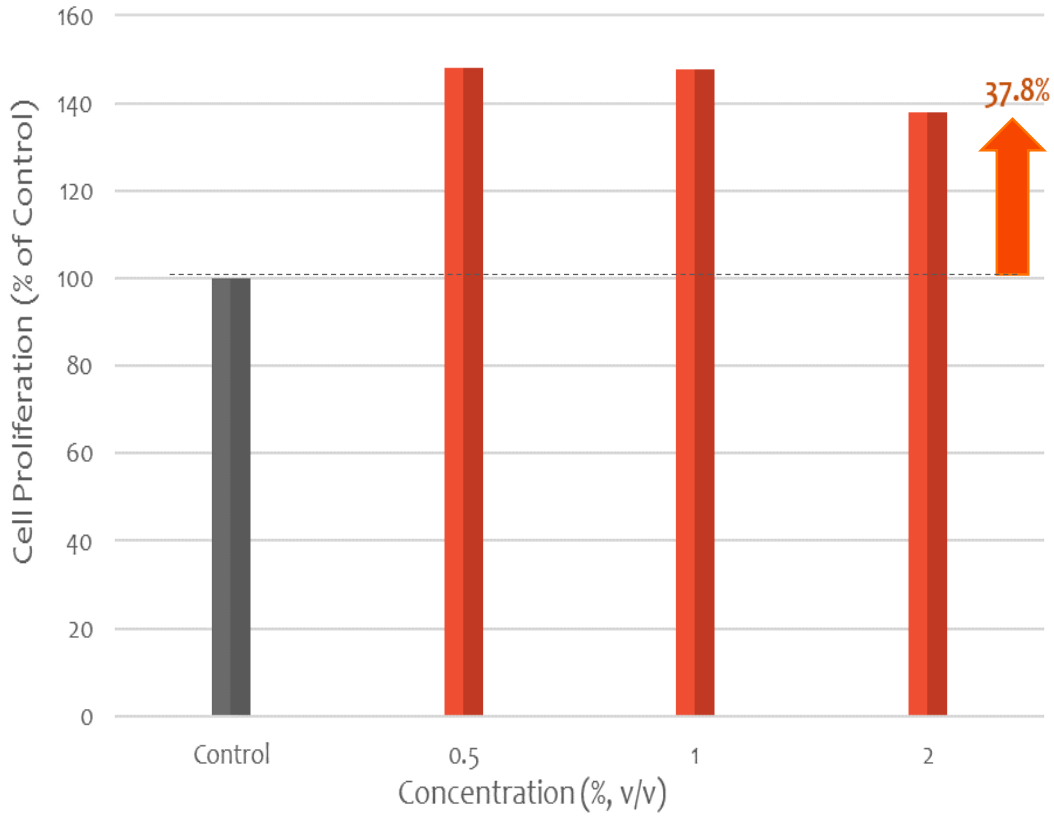
Hair Growth Cycle

- Anagen: Hair grows thick
- Catagen: Hair roots start degenerating
- Telogen: Growth stops completely
- Early anagen: Old hair falls out and new hair grows

Human dermal papilla cells (HDPCs) comprise a group of specialized fibroblasts. HDPCs play a critical role in regulating hair follicle development and periodic regeneration. Human hair growth has a unique repetitive cycle composed of the anagen, catagen, and telogen phases.

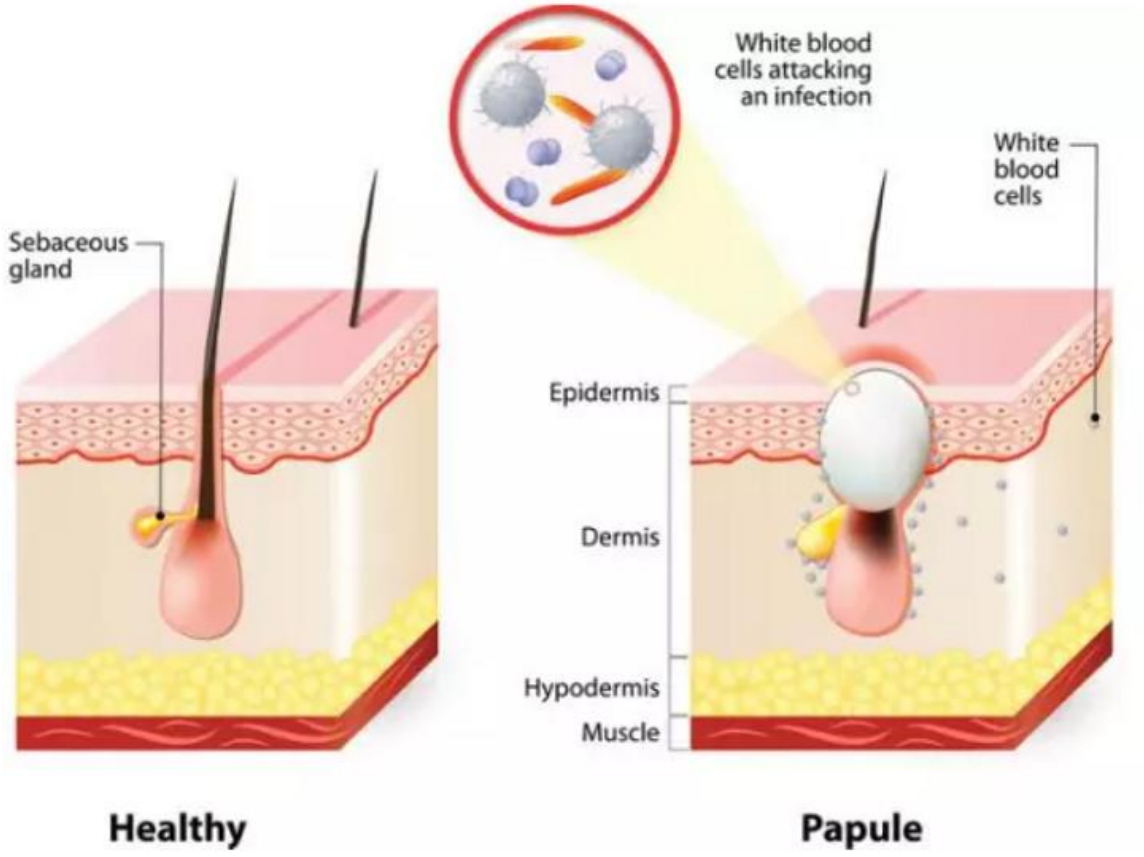
in vitro Efficacy Evaluation: Hair Growth Effect

Hair Cell Proliferation in Human Dermal Papilla Cells (HDPCs)



The **proliferation of human dermal papilla cells** was evaluated by measuring the metabolic activity using a 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay. HDPCs were stimulated in the presence of various concentrations of BotaCair. As a result, **2% of BotaCair increased the hair cell proliferation rate by 37.8%.**

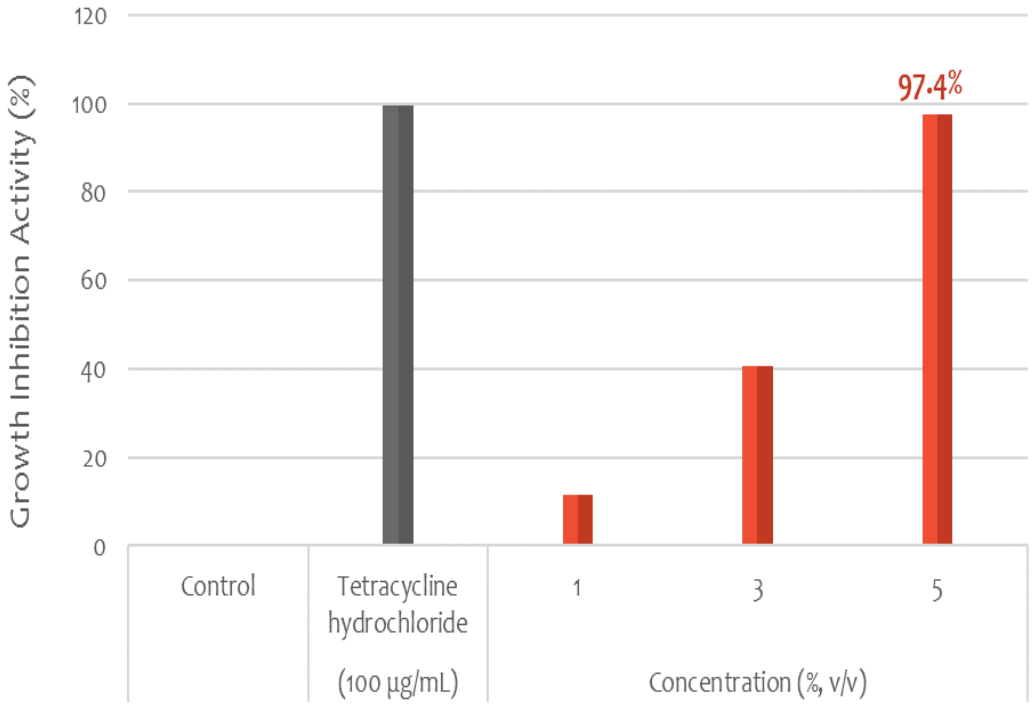
Bacterial Folliculitis Caused by *Staphylococcus aureus*



When *S. aureus* invades the follicle through the pores of the skin, an inflammatory reaction occurs in the sebaceous gland and the pores are blocked. If the inflammatory reaction becomes severe, the subcutaneous tissue of the scalp is collapsed, and the hair falls out of the follicle.

in vitro Efficacy Evaluation: Anti-microbial Effect

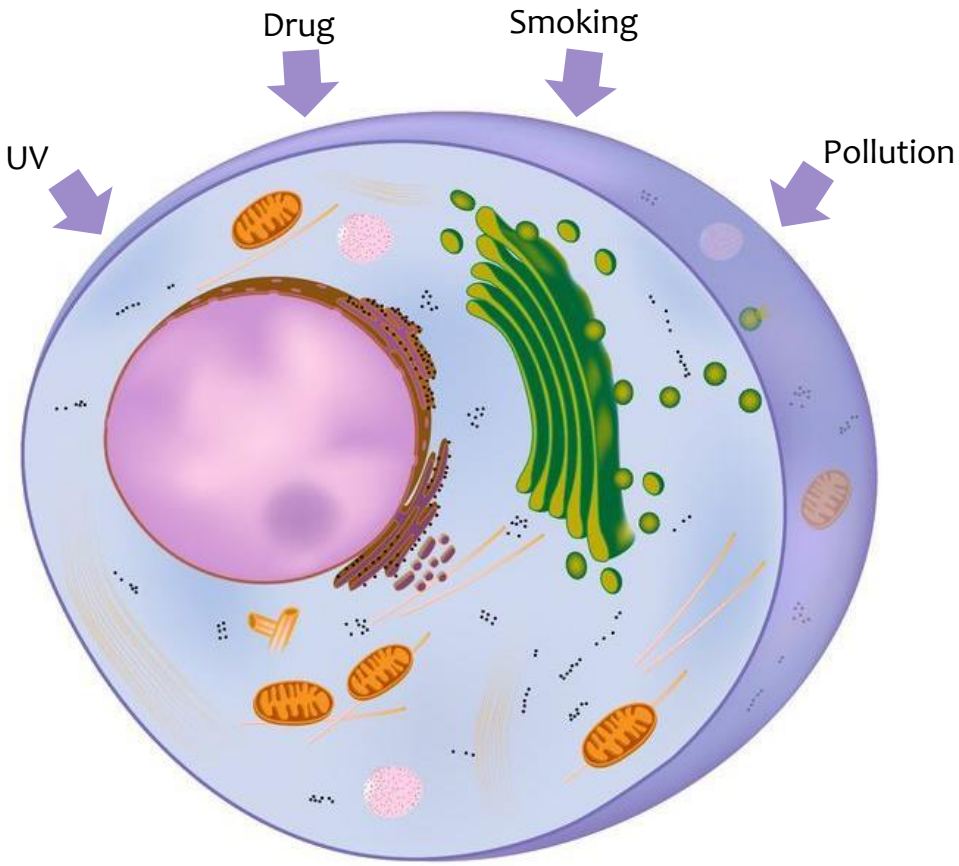
S. aureus Growth Inhibition Activity



The **anti-microbial property of BotaCair** has been evaluated by the inhibition of *S. aureus* growth. As a result, **5% of BotaCair inhibited *S. aureus* growth rate by 97.4%.**

Oxidative Stress

Reactive Oxygen Species (ROS) can be increased by



Intracellular ROS may induce

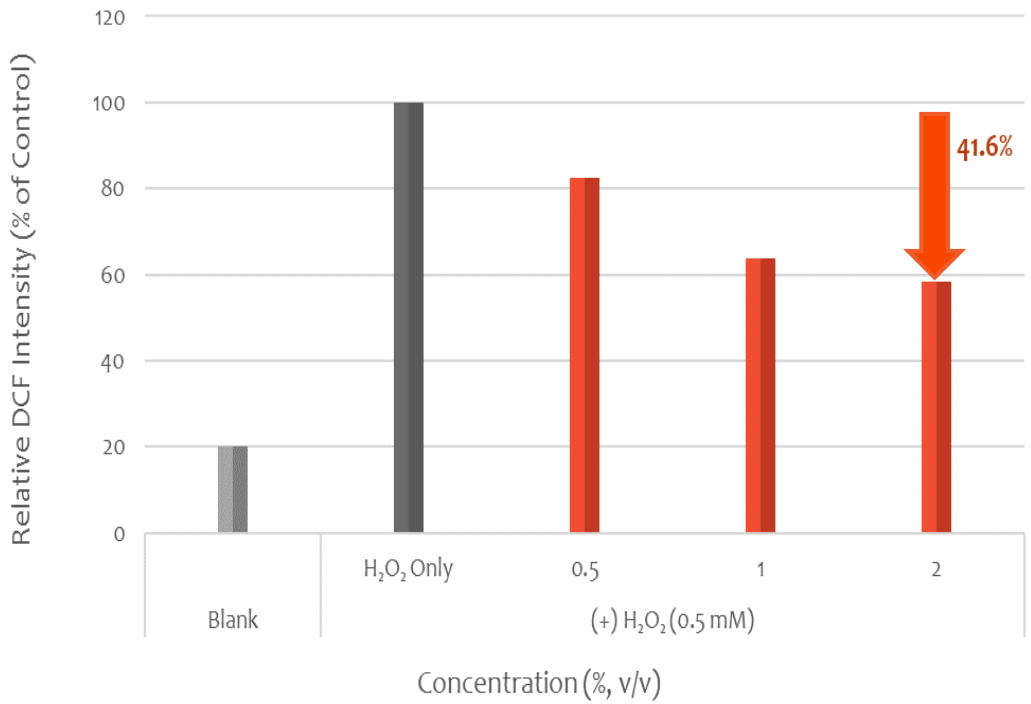
- DNA damage
- Lipid peroxidation
- Amino acid oxidation: protein damage
- Oxidation of co-factors: enzyme inactivation
- Chronic inflammation

ROS → **Skin Aging**

Inflammation

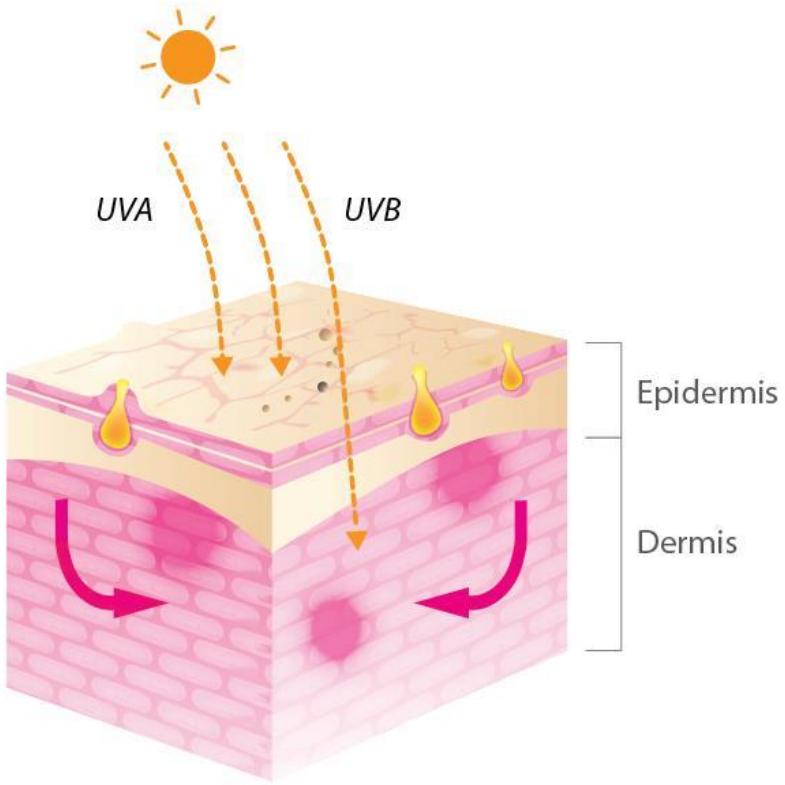
in vitro Efficacy Evaluation: Anti-oxidant Effect

ROS Generation Inhibition Activity



Anti-oxidant property of BotaCair has been evaluated by measuring the decrease in the ROS content produced in cells. As a result, **2% of BotaCair decreased the ROS production by 41.6%.**

What is Photoaging?



UV radiation causes skin aging

↓

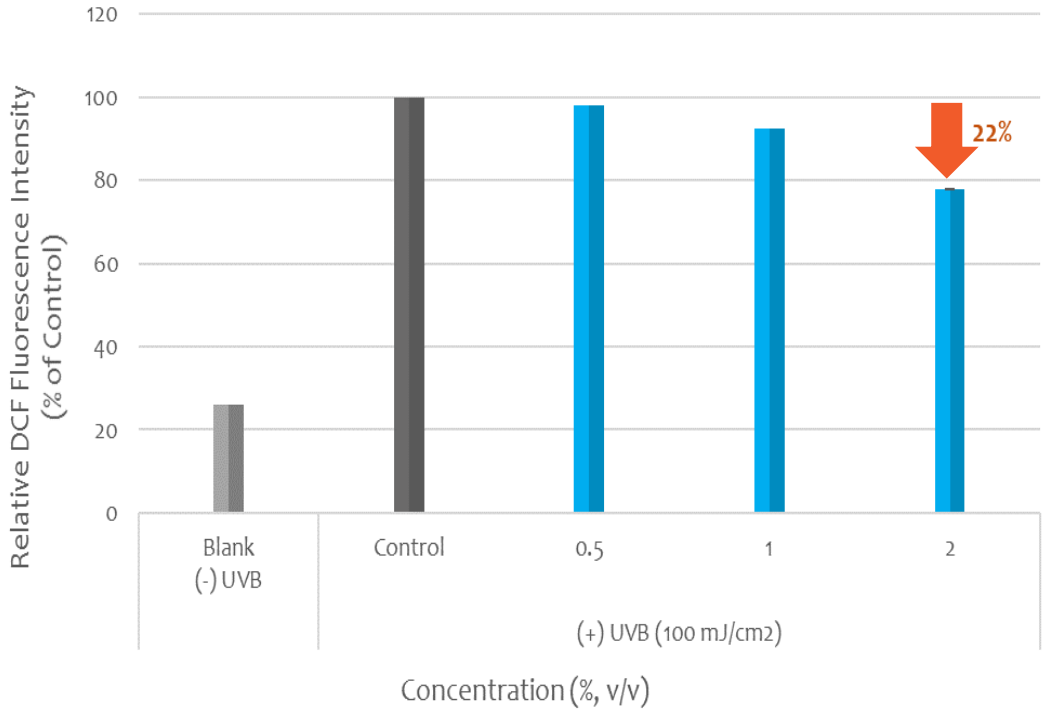
Free radicals ↑

↓

Photodamage
(Inflammation, wrinkle, and pigmentation)

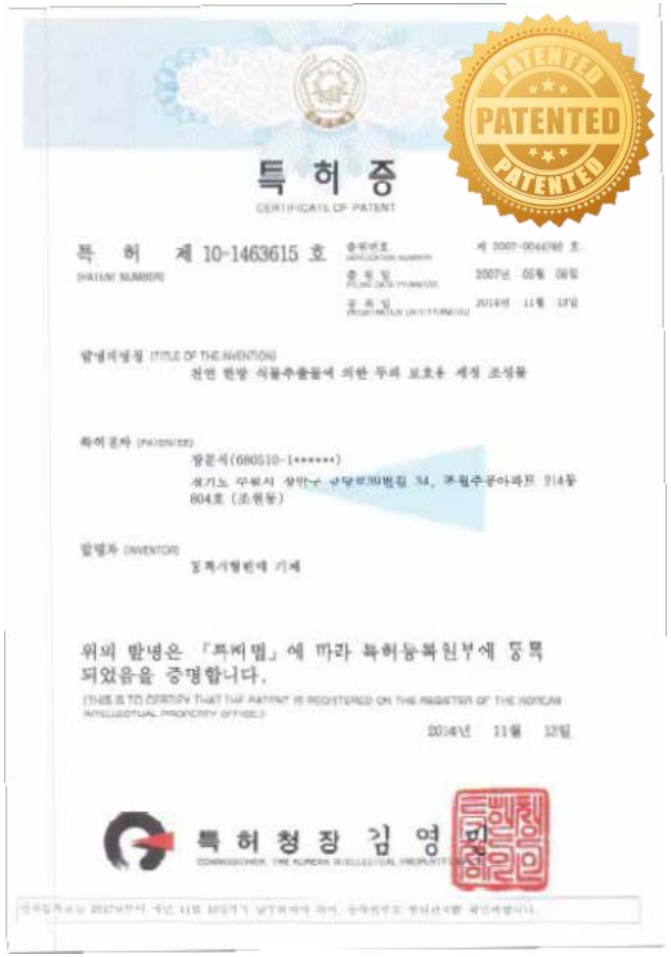
in vitro Efficacy Evaluation: Anti-photoaging Effect

ROS Generation Inhibition Activity after UVB Irradiation in Human Dermal Fibroblasts



BotaCair significantly **reduced ROS generation** caused by UVB irradiation in human dermal fibroblasts, neonatal (HDFn) (100 mJ/cm^2) in a dose-dependent manner. As a result, **2% of BotaCair showed the 22% of anti-photoaging effect.**

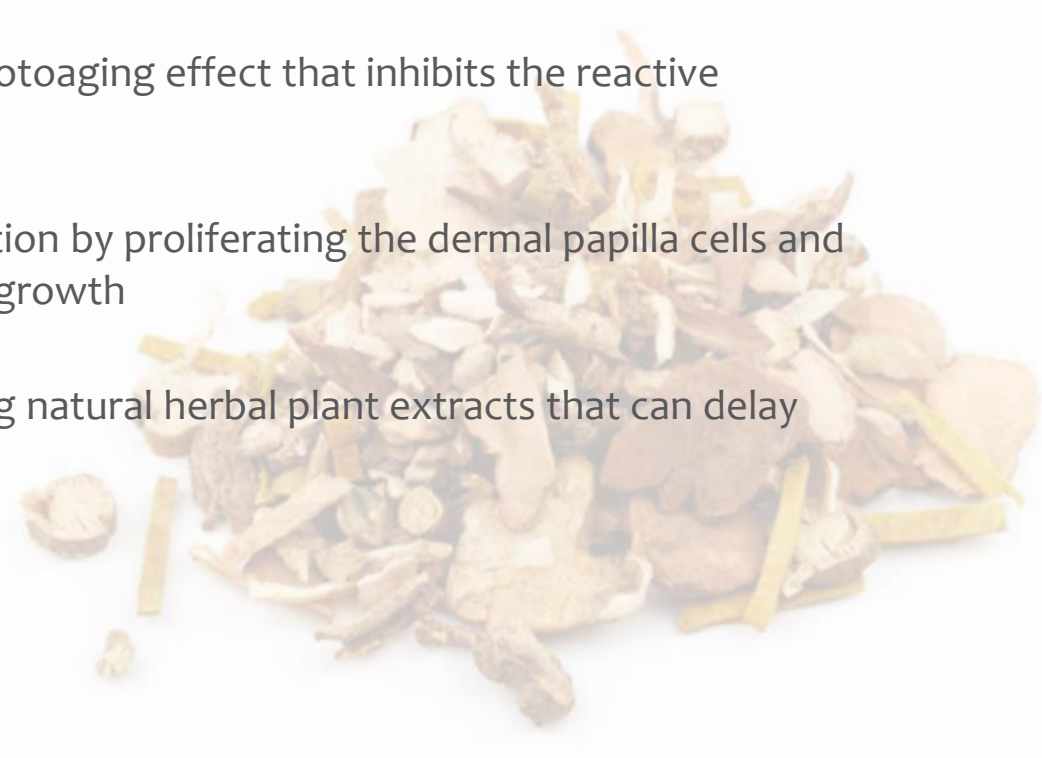
Patent



- Title: Cleansing composition for skin protection by natural oriental plant extracts
- Patent Number: 10-1463615
- Registration Date: 13 Nov, 2014
- Patented for a hair cleaning composition containing natural herbal plant extracts that can delay hair loss

Marketing Points

- A complex of 4 oriental herbal ingredients with a powerful anti-oxidant effect
- Potentially suppresses scalp acne with anti-microbial effect against *S. aureus*, which can lead to the improvement in the scalp condition
- Helps to keep the scalp healthy through an anti-photoaging effect that inhibits the reactive oxygen species generation
- Suppresses hair loss and accelerates hair regeneration by proliferating the dermal papilla cells and promoting the expression of genes related to hair growth
- Patented for a hair cleaning composition containing natural herbal plant extracts that can delay hair loss



Product Information

- **Product Name:** **BotaCair(GPD)**
- **INCI Name:** **Sophora Flavescens Root Extract, Scutellaria Baicalensis Root Extract, Coptis Japonica Root Extract, Morus Alba Bark Extract**
- **Dosage:** 1 – 5%
- **Formulation:** Add to the formulation when the temperature is lower than 55°C. Recommended to add after the cooling process.
- **Storage:** Avoid direct light or UV. Keep it in a dry area at room temperature.

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