

Product for hair care, anti-inflammatory, anti-oxidant, sebum control effects

**Arnimo**

*Alpine plant for total care*

Approved by  
**ECOCERT**  
RAW MATERIAL  
COSMOS APPROVED

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## Plant Story

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*Arnica montana* is a perennial herbaceous plant in the sunflower family Asteraceae. Commonly known as mountain tobacco, mountain arnica, and wolf's bane, it is native to central Europe. It grows mostly on alpine meadows and mountainous regions up to nearly 3,000 m altitudes.

*A. montana* is one of the best-known homeopathic remedies and has been medicinally used for centuries. Arnica is **applied to the skin for bruises, aches, sprains, and arthritis**. It is also **used for insect bites, muscle pain, acne, and varicose veins**. *A. montana* is used in **hair preparations for preventing dandruff and stimulating circulation to the scalp**.

## Plant Story: Old Story of *A. montana* (anti-inflammation)



Arnica flower has been traditionally used to treat mostly **bruises, pain relief, and inflammation-related diseases.**

This was known by the behavior of **mountain goats** which **look for Arnica flower to treat when they fall**, and local people have learnt and started to apply it to bruises, externally. It is called a fall herb in Germany. Many pharmaceutical companies adopt *A. montana* for their pain relief products.

Scientifically, it is demonstrated that the methanol extract of *A. montana* flower was effective on **inflammation** and **oxidative stress** in an animal model, showing **reduced levels of NO, TNF- $\alpha$  and interleukins.**

## Plant Story: The usage of *A. montana*

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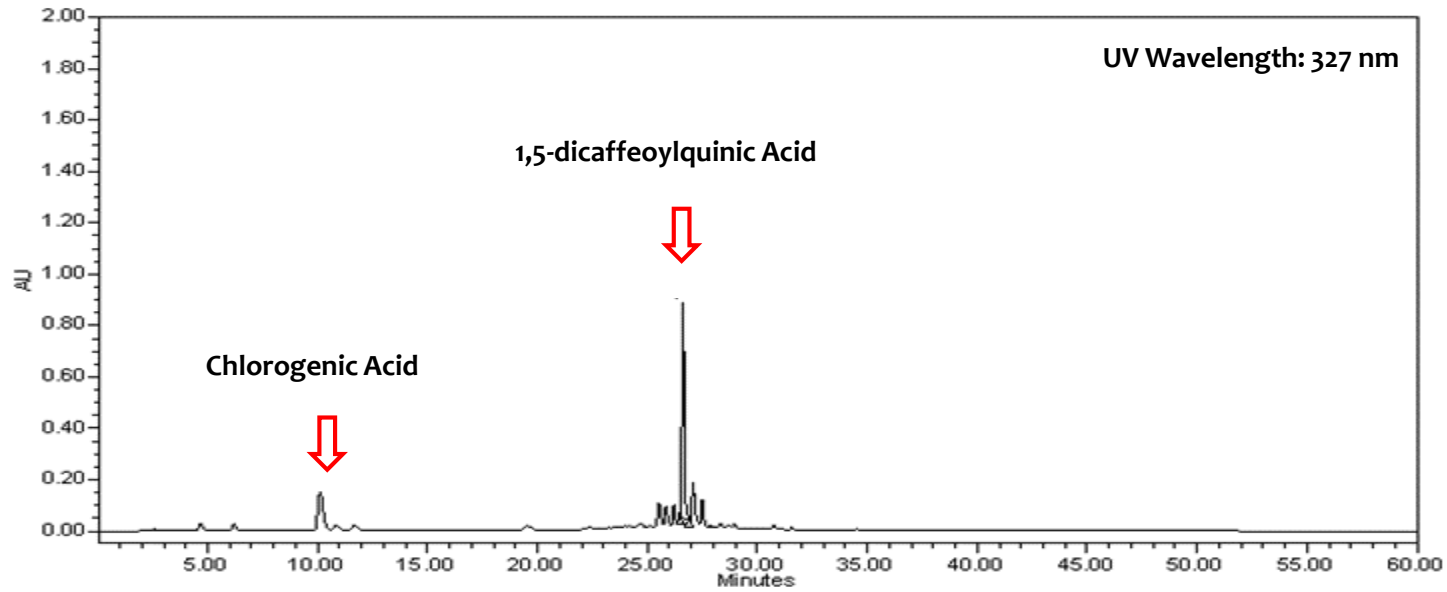


Traditionally, arnica flower has been **widely applied to hair** treatments as well such as **hair growth, stimulating hair follicles, and rejuvenating the scalp or herbal tincture.** Arnica extract or arnica flower oil is known as effective for treating **hair loss, graying hair, and dandruff.**

# HPLC Analysis

## 🔬 HPLC Chromatogram

Main Active Compound of Arnimo is 1,5-dicaffeoylquinic Acid.



# Hair Care Effect

## ⌘ Hair Growth Effect (*in vitro*)

Hair Cell Proliferation of Human Dermal Papilla Cells (HDPCs)

## ⌘ Anti-dandruff Effect (*in vitro*)

*M. furfur* Growth Inhibition Activity

## ⌘ Scalp Exfoliation Effect (*in vivo*)

Shedding Activity of Dead Skin Cells on Scalp

# *in vitro* Efficacy Evaluation

## ⌘ Anti-inflammatory Effect

NO Synthesis Inhibition in Macrophages (RAW 264.7)

TNF- $\alpha$  Inhibition in Macrophages (RAW 264.7)

## ⌘ Anti-oxidant Effect

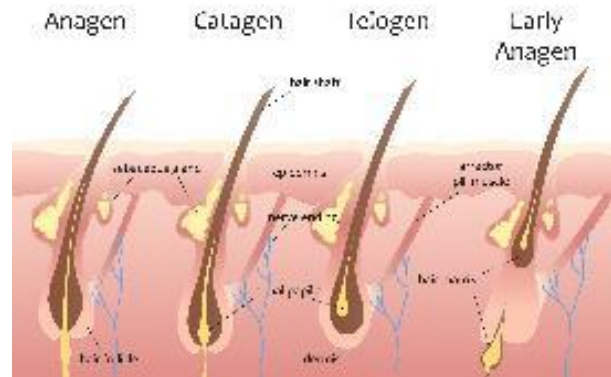
DPPH Scavenging Activity

## ⌘ Sebum Control Effect

Inhibition of Lipid Droplet Formation in Sebocytes

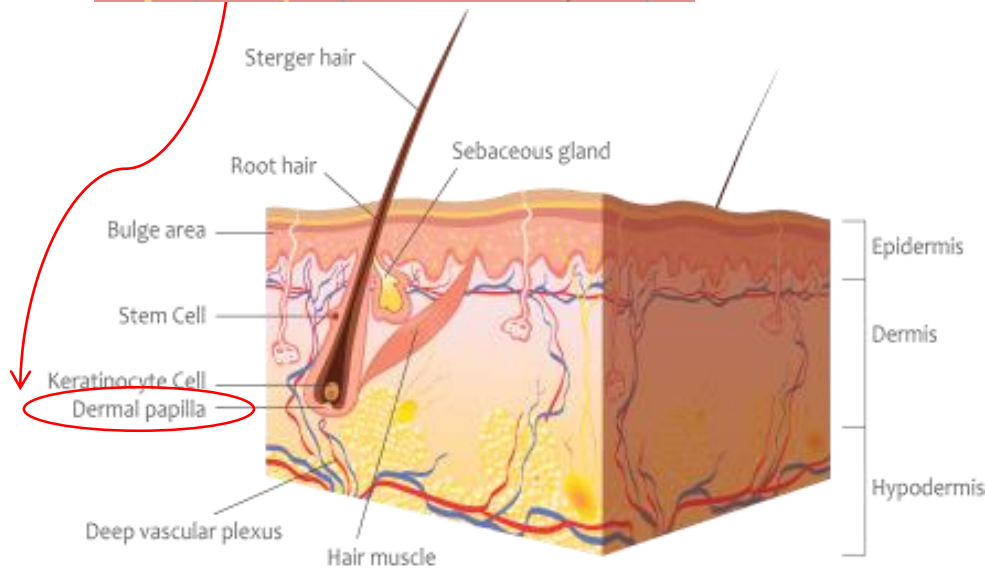


# Hair Growth Cycle



## Hair Growth Cycle

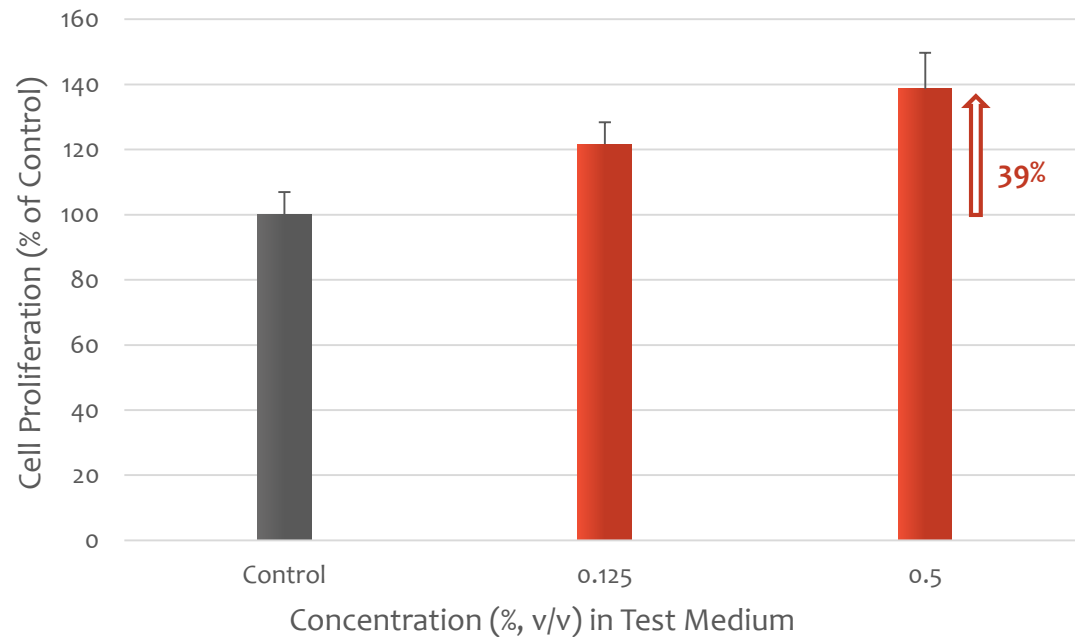
- Anagen: Hair grows thick
- Catagen: Hair roots start degenerating
- Telogen: Growth stops completely
- Early anagen: Old hair falls out and new hair grows



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

## •• The Proliferation of Human Dermal Papilla Cells (HDPCs)

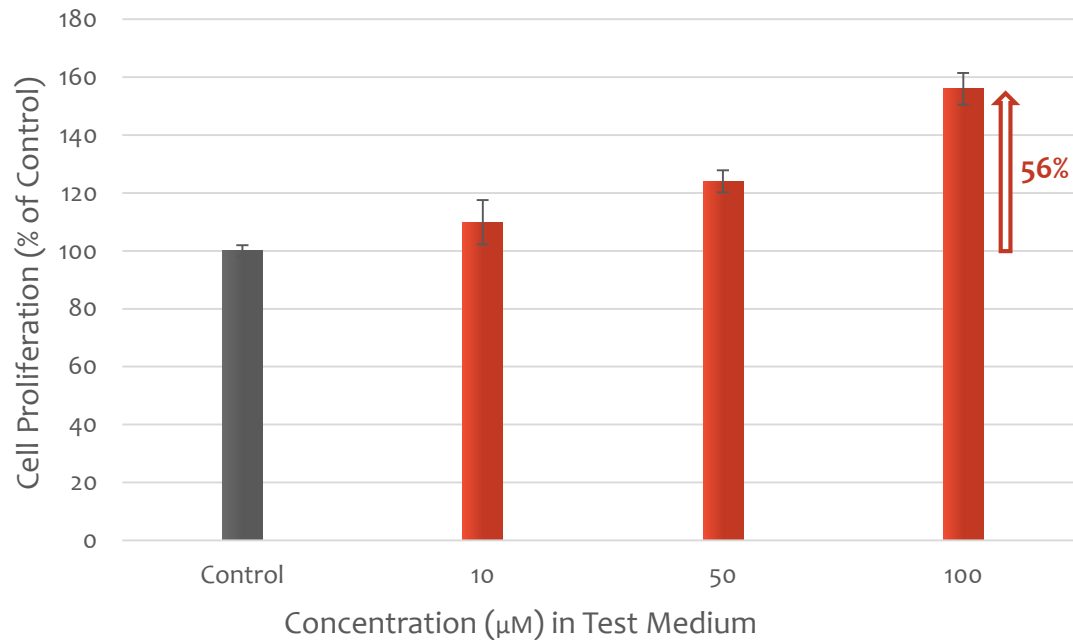


The **proliferation of HDPCs** was evaluated by measuring the **metabolic activity** using a 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay. HDPCs were stimulated in the presence of various concentrations of Arnimo. The highest cell proliferation increase was observed as **39%** at **0.5% of Arnimo**.



# in vitro Efficacy Evaluation: Hair Growth Effect of Active Compound

## •• The Proliferation of Human Dermal Papilla Cells (HDPCs) of 1,5-dicaffeoylquinic Acid

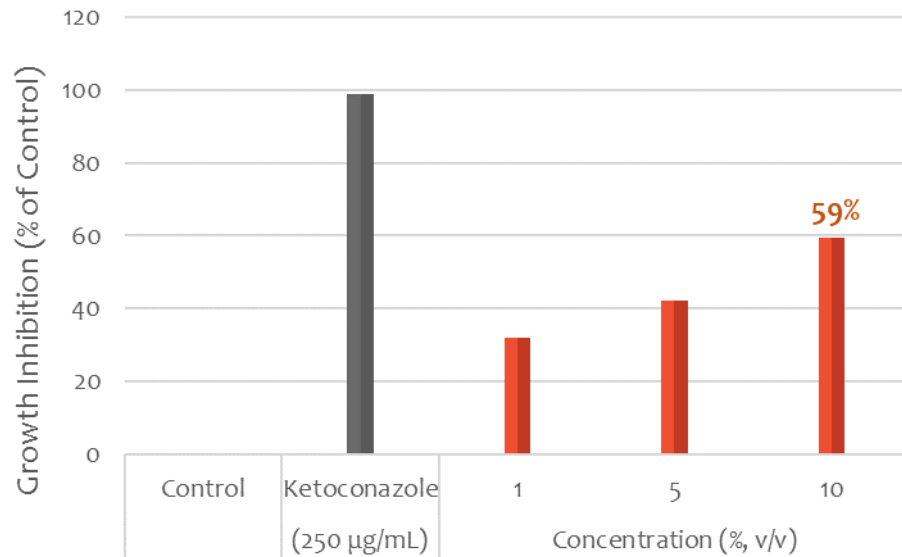


The **proliferation of HDPCs** was evaluated by measuring the **metabolic activity** using a 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay.

HDPCs were stimulated in the presence of various concentrations of Arnimo. The highest increase in cell proliferation was measured as **56%** at **100 µM of 1,5-dicaffeoylquinic acid**.

# in vitro Efficacy Evaluation: Anti-dandruff Effect

## 🍷 M. furfur Growth Inhibition Activity



The **anti-dandruff effect** was revealed by measuring the **growth inhibition activity** using the minimum inhibitory concentration (MIC) assay.

As a result, **10% Arnimo** inhibited **59%** of the growth of *M. furfur* (*Malassezia furfur*).

## in vivo Evaluation: Scalp Exfoliation Effect

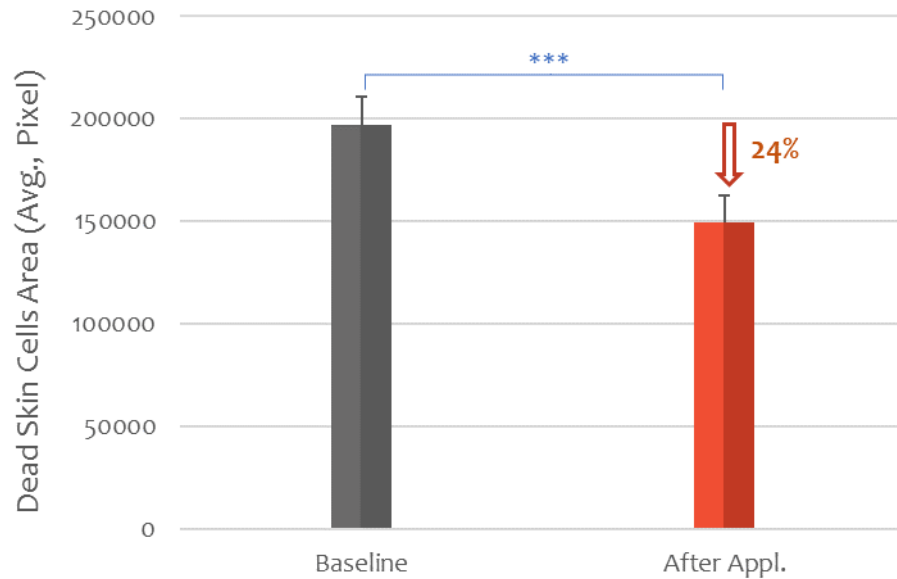


- **Target Site:** Scalp
- **Subjects:** 20 adults, aged between 20 to 60
- **Test Item:** Shampoo with 5% Arnimo
- **Application:** Massaging the scalp with 7.5 g of the test item and rinse well
- **Measurements:** Before & after application
- **Environmental Condition:** 20~24°C, 50±10 % Relative Humidity
- **Test Instrument:** iScope and Keratin Sticker

# in vivo Evaluation: Scalp Exfoliation Effect

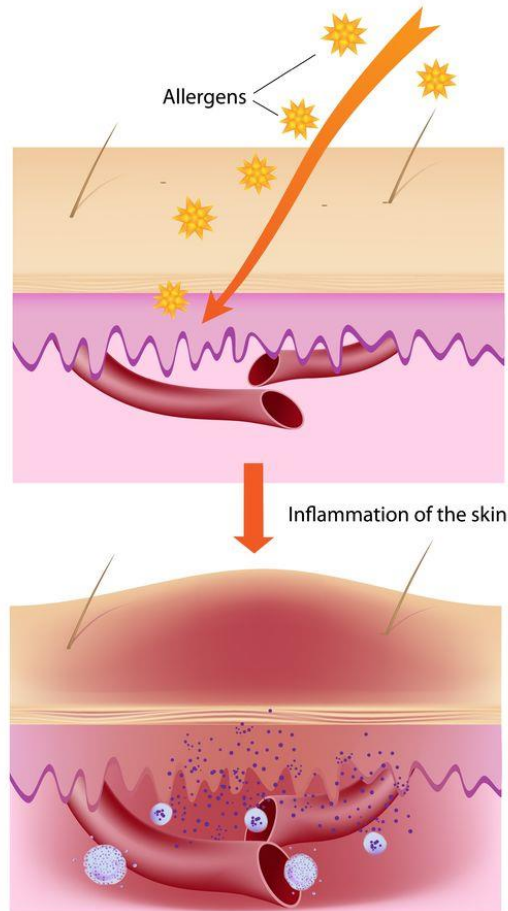
## ◉◉ Shedding Activity of Dead Skin Cells on Scalp

Probability  $p$  (Paired  $t$ -test, Significant:  $***p < 0.001$ )



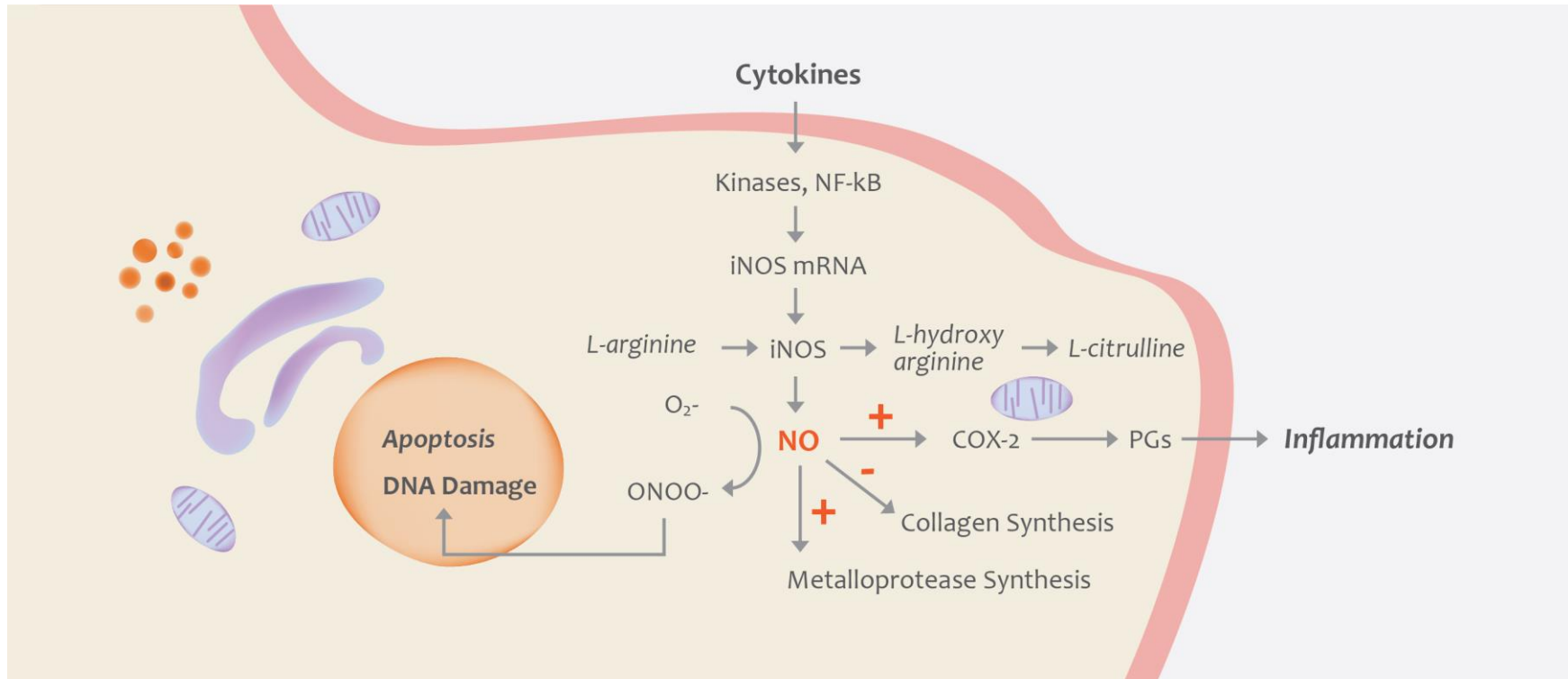
#	Baseline	After Appl.
1		
2		
3		

# What is Skin Inflammation?



Inflammation is part of the complex immunological responses to a wide range of harmful stimuli including skin injury, tissue necrosis, infection, and irritants. The immune system is responsible for protecting our body from the harmful stimuli and of maintaining homeostasis. Like any other part of the body, the skin can be involved in immune responses. Inflammation in the skin often causes a rash to form. It's a response from the immune system to conditions such as bacterial/viral/fungal infections, allergic reactions, heat, and sunlight. The symptoms of skin inflammation are rash, skin redness, blisters or pimples, warmth, and thickening of the skin in the affected area.

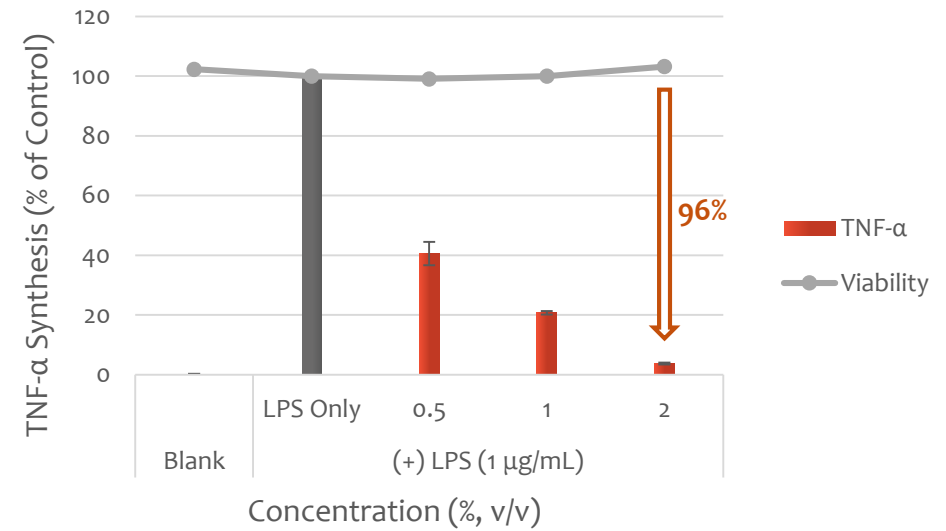
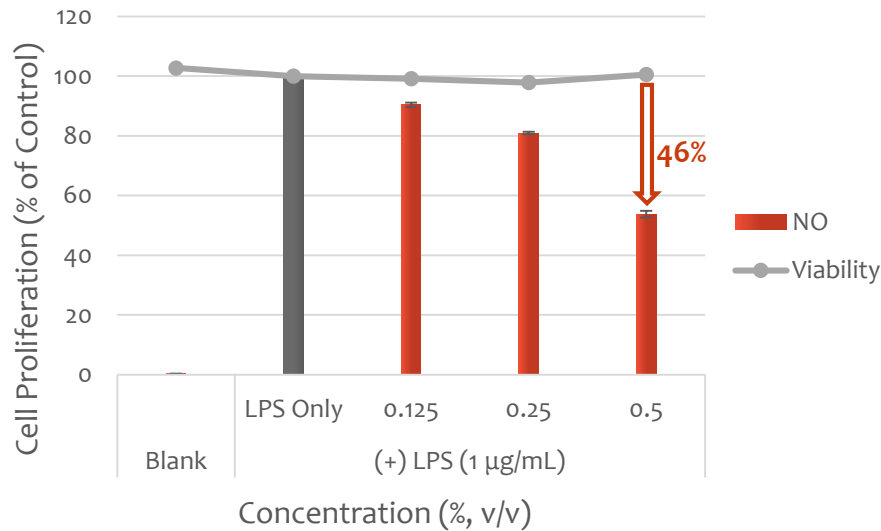
# Inflammation Mechanism



# in vitro Efficacy Evaluation: Anti-inflammatory Effect

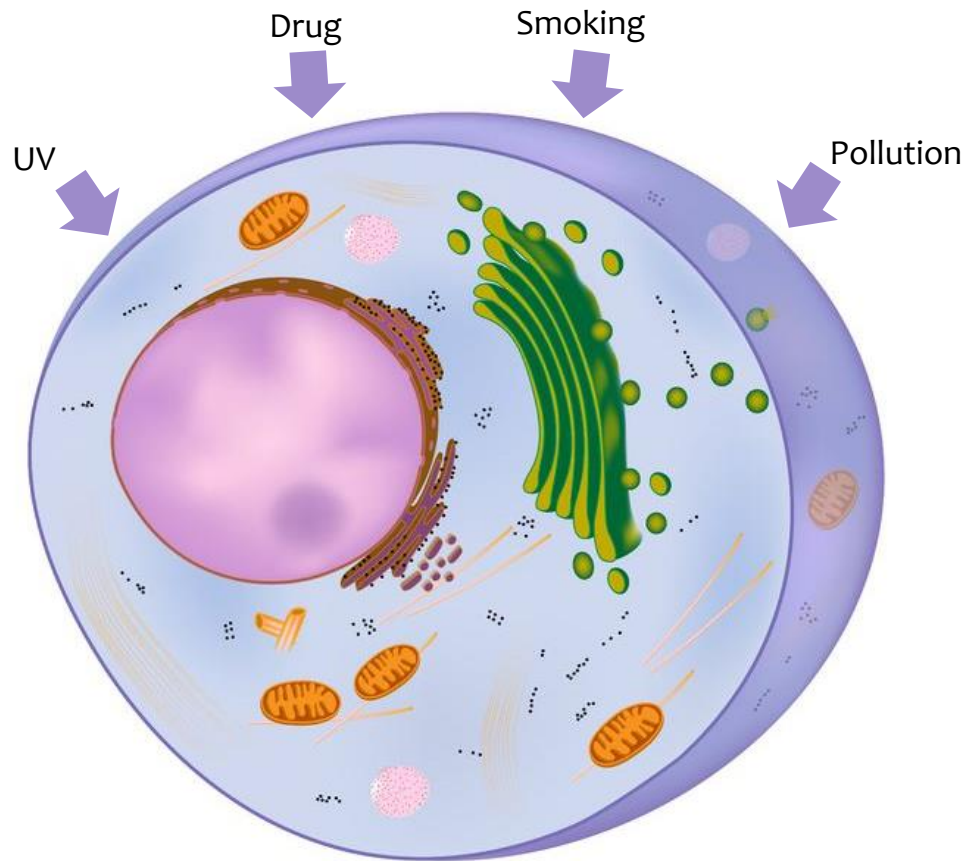
•• NO Synthesis Inhibition in Macrophages (RAW 264.7)

•• TNF-α Inhibition in Macrophages (RAW 264.7)



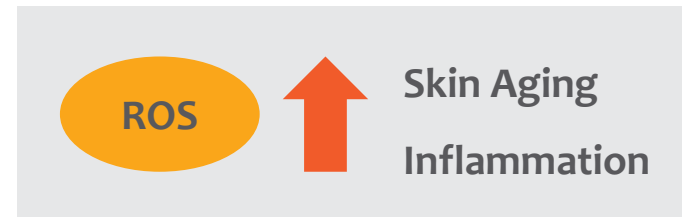
# Oxidative Stress

Reactive Oxygen Species (ROS) can be increased by



Intracellular ROS may induce

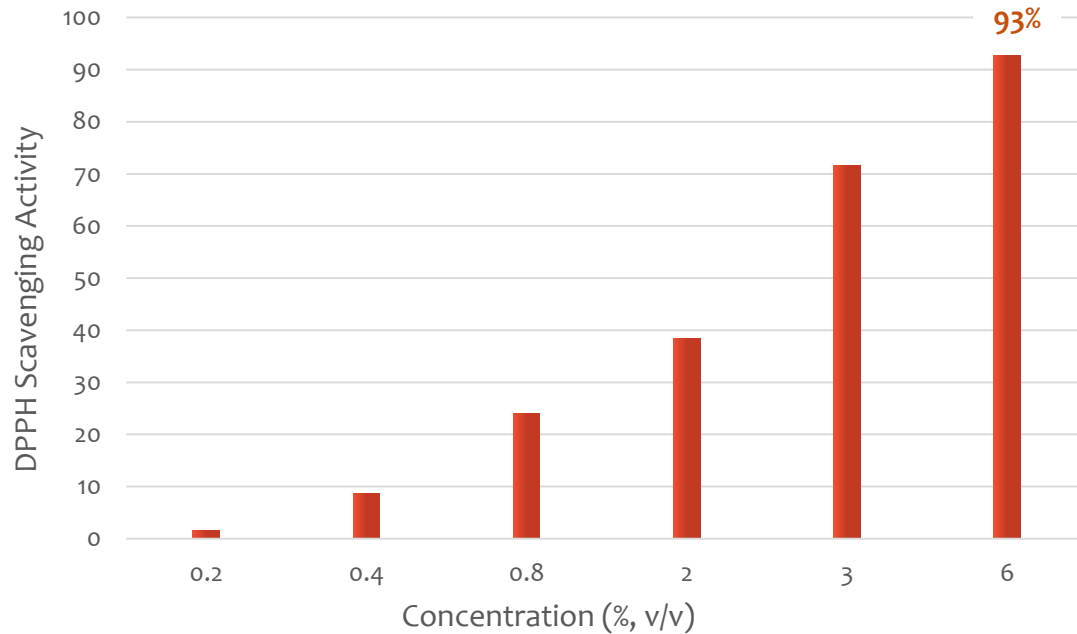
- DNA damage
- Lipid peroxidation
- Amino acid oxidation: protein damage
- Oxidation of co-factors: enzyme inactivation
- Chronic inflammation





# in vitro Efficacy Evaluation: Anti-oxidant Effect

## 🔴 DPPH Scavenging Activity



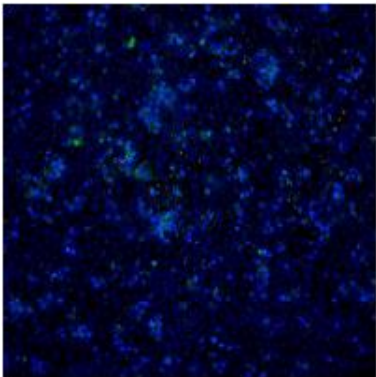
Anti-oxidant property of **Arnimo** has been measured by measuring **DPPH** (1,1-diphenyl-2-picrylhydrazyl radical) Scavenging Activity.

As a result, **the highest DPPH scavenging activity** was observed as **93% at 6.3% of Arnimo**.

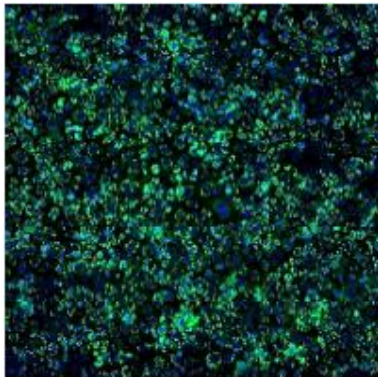
# in vitro Efficacy Evaluation: Sebum Control Effect

## 🔬 Inhibition of the Formation of Lipid Droplets in SEBO662AR Sebocyte Cell Line

Negative Control

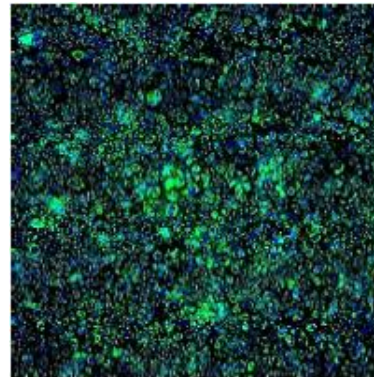


Positive Control  
(+) Testosterone (1 nM)  
+ Urban Dust 1649b (0.1 mg/ml)



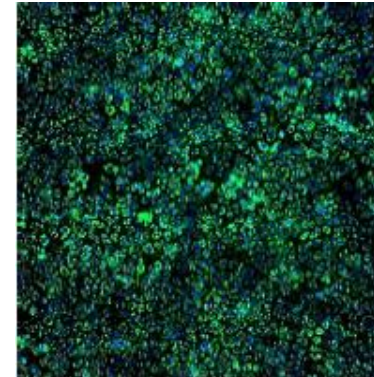
Arnimo Freeze-dried (FD) Powder  
Test Group

3 µg/ml



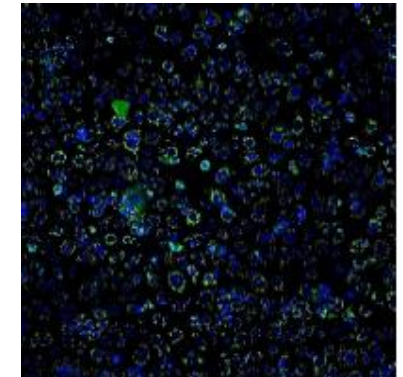
\* Ineffective

10 µg/ml



\* Ineffective

30 µg/ml



\* 40% inhibition


Arnimo FD Powder 30 µg/ml = Arnimo 0.5%

# Marketing Point

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- Arnica flower is a traditional anti-inflammatory agent in Europe
- Strong anti-inflammatory effects were shown *in vitro*
- Hair growth and sebum control effects *in vitro* for a total hair care solution
- Arnimo can be applied to products for oily skin

# Product Information

- ⦿ **Product Name:** Arnimo(NB), Arnimo(PG), Arnimo(PD)-RSPO  , Arnimo(GOL)-RSPO
- ⦿ **INCI Name:** Arnica Montana Flower Extract
- ⦿ **Dosage:** 1 – 3%
- ⦿ **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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