



ANTI-HAIR LOSS
MICROBIOTA MODULATOR

HAIRILINE®

GREENTECH PIONEERING
ETHICAL
BIOTECHNOLOGIES
WE SOURCE NATURE TO RESOURCE THE FUTURE

HAIR ISSUE STUDIED BY GREENTECH



ALOPECIA

Hair loss, or alopecia, is a common disorder that affects people of all ages. It is characterized by the formation of very fine vellus hairs resulting from the miniaturization of the hair follicles, thereby leading to the appearance of baldness. The most common type (90%) is androgenetic alopecia. It concerns 28% of males between 18-29 years old and 53% of males after 40 years old. The pathophysiology of alopecia is multifactorial, including stress, nutrition, exposome, genetic predisposition, hormonal sensibility...

Microbiota also seems to play a key role in hair growth disorders. Finding balance both in bacteriobiota and mycobiota of the hair would then be a major step towards healthy hair.

Currently, only two Food and Drug Administration (FDA)-approved hair growth-promoting drugs, namely Minoxidil and Finasteride, are available in the market. However, these drugs are of limited use, because of their side effects.

Aware of the adverse effects of current therapies and being at the forefront of innovation in terms of microbiota, Greentech designed a natural alternative strategy using a systemic approach.

REBALANCES

BACTERIOBIOTA &
MYCOBIOTA

SLOWS

HAIR-LOSS

RESTORES

HAIR VITALITY
& DENSITY

IMPROVES

WNT/ β -CATENIN
PATHWAYS

ACTIONS

MOLECULES

- **SESQUITERPENES** : LINDERANE (0.5-2.0 %) & LINDERALACTONE (1.5-3.0 %)
- **POLYPHENOLS** (including Catechins & Tannins) : 20-35 %

SOURCING

LINDERA STRYCHNIFOLIA ROOTS
NATIVE FROM SOUTH EAST OF ASIA

« A PROMOTER OF LONGEVITY
AND AN ELIXIR OF LIFE »



COSMETIC USES

- SCALP MICROBIOTA HEALTH
- ANTI-HAIR LOSS PRODUCTS
- ANTI-AGING HAIR CARE
- DAILY HAIR CARE

- > ACTION ON BACTERIOBIOTA & MYCOBIOTA
- > FOCUS ON THE KEY PATHWAYS: WNT/ β -CATENIN
- > COMPARISON WITH MINOXIDIL

The aim of our investigation is to **normalize the Wnt signaling pathway, which plays a major role in the regeneration of hair follicle cells** by acting on inhibitory proteins such as DKK-1, DKK-3 and sFRP-1.

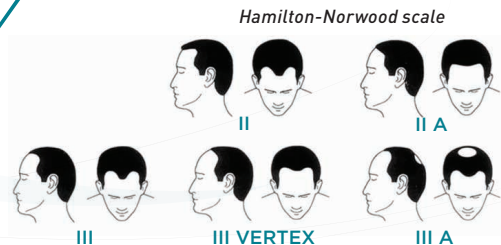


Regeneration of the follicle is realized from a reservoir of stem cells that proliferate and differentiate under the effect of signaling pathways (**Wnt/ β -catenin**). **DKK-1** blocks the initiation of Anagen phase, **TGF β** improves Catagen phase and **sFRP-1** blocks **Wnt activation**.

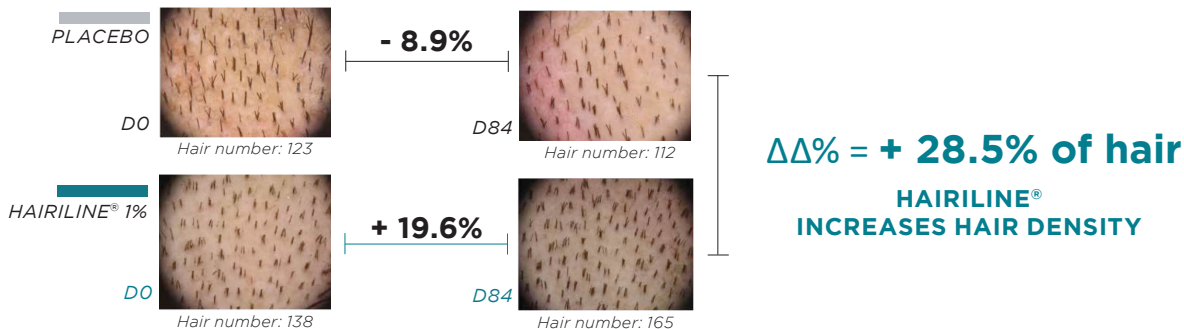
PROVEN EFFICACY

CLINICAL STUDY - IN VIVO

Simple blind test on 17 men with a chronic hair-loss (type III alopecia).
Mean age : 51 years old. HAIRILINE® 1% versus placebo.
Twice daily application on half head during 84 days. Evaluation at D0, D42 and D84.
Phototrichogram



• HAIRILINE® IMPROVES HAIR NUMBER



• HAIRILINE® IMPROVES HAIR NUMBER AFTER 84 DAYS

One solution proposed against chronic alopecia is hair transplantation.
Between 3000 and 5000 hairs are then transplanted.

With HAIRILINE® :

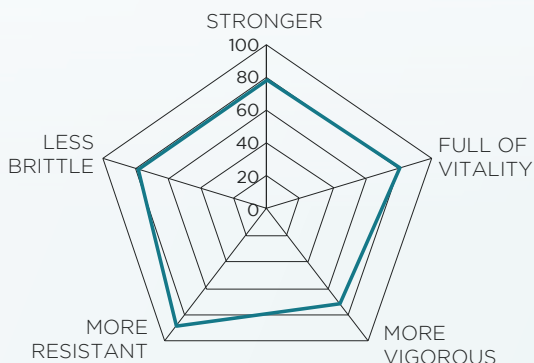
HAIRILINE®

+ 7%

~ + 7 000 hairs

• SELF-ASSESSMENT

% of men reporting	
A SPEED UP OF THE GROWTH	81%
A DECREASE OF HAIR IN BRUSH, ON CLOTHES AND PILLOWS	73%
A STIMULATION OF HAIR GROWTH AND A SLOW DOWN OF FALL	77%
A DENSIFICATION OF HAIR	81%



HAIRILINE® REDUCES HAIR LOSS AND IMPROVES QUALITY OF HAIR

EVALUATION OF HAIRILINE® ABOUT HAIR PROPERTIES

PROVEN EFFICACY

CLINICAL STUDY - *IN VIVO*

• CHARACTERIZATION OF ALOPECIA SCALP MICROBIOME

We first characterized the alopecia microbiota and secondly evaluate the effect of HAIRILINE®.

Simple blind test on 24 men (12 healthy & 12 type II & III Alopecia). Mean age 49 years old. HAIRILINE® 1% versus placebo. Twice daily application during 84 days. Measurements : 16S ribosomal RNA for bacteria & ITS1 (Internal Transcribed Spacer 1) DNA for fungi

CHARACTERIZATION OF ANDROGENETIC ALOPECIA BACTERIOBIOTA (at Day 0)



At Phylum & Genus levels

- **Comparable** repartition between healthy and androgenic alopecia scalps (in agreement with Polak-Witka *et al.*, 2019)

At Species level

- **Lower** mean reads of *Staphylococcus epidermidis* ($p < 0.05$)
- **Higher** mean reads of : *Cutibacterium acnes* and *Stenotrophomonas sp* ($p < 0.05$) in alopecia as compared to control, inducing microinflammation, keratinase secretion and therefore hair-loss.

CHARACTERIZATION OF ANDROGENETIC ALOPECIA MYCOBIOTA (at Day 0)

At Phylum level

- **Lower** abundance of *Basidiomycota* and **higher** abundance of *Ascomycota* as compared to control

At Genus level

- **Lower** proportion of *Malassezia* genus and increase of other fungal genus inducing keratinase synthesis and therefore acceleration of hair-loss.

At Species level

- **Decrease** of *Malassezia globosa*/*Malassezia restricta* ratio as compared to control.

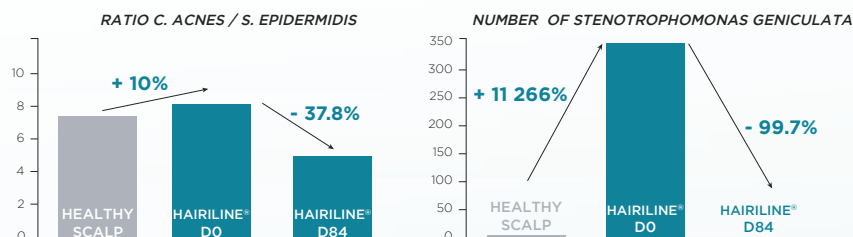
• EFFECT OF HAIRILINE® ON THE SCALP MICROBIOME

WITH HAIRILINE® (at D84)

BACTERIOBIOTA

At Phylum & Genus levels

HAIRILINE® MAINTAINS BACTERIAL DIVERSITY



At Species level

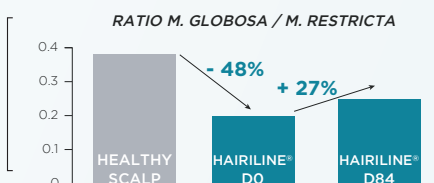
HAIRILINE® decreases the ratio of *Cutibacterium acnes*/*Staphylococcus epidermidis* involved in androgenic pathogenesis. A decrease of *Stenotrophomonas geniculata* was also observed.

HAIRILINE® REBALANCES THE BACTERIOBIOTA RATIO OF THE SCALP, LINKED TO HEALTHY SCALP.

WITH HAIRILINE® (at D84)

MYCOBIOTA

At Species level



HAIRILINE® rebalances the *M. restricta*/*M. globosa* ratio.

HAIRILINE® RESTORES THE SCALP MYCOECOLOGY.

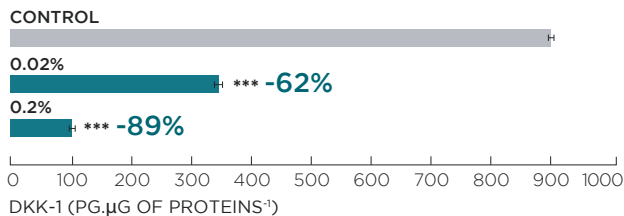
PROVEN EFFICACY

IN VITRO ANALYSIS

• HAIRILINE® MODULATES INHIBITORS OF THE MAIN SIGNALING PATHWAYS FOR HAIR GROWTH

Dickkopf related protein-1 (**DKK-1**) is a protein and a potent antagonist of the Wnt signaling pathway. It induces keratinocytes apoptosis and catagen phase and is overexpressed in alopecia.

*Dermal fibroblast cells from a healthy donor (54 years old).
Treatment during 48h with HAIRILINE® at several concentrations.
Protein quantification in the supernatant by ELISA. *** p<0.001 vs control.*



HAIRILINE® INHIBITS THE SECRETION OF THE CATAGEN INDUCER, DKK-1, LIMITING HAIR LOSS.

• HAIRILINE® DECREASES VASOCONSTRICTION FACTOR RELEASE

Endothelin-1 (**EDT-1**) is a potent vasoconstrictor. It induces the regression of Anagen hair follicle.

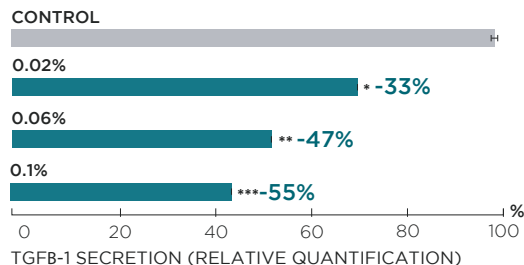
*Dermal microvascular endothelial cells from a healthy donor (30 years old).
Treatment during 24h with HAIRILINE® at several concentrations.
Protein quantification in the supernatant by ELISA. * p<0.05 vs control.*



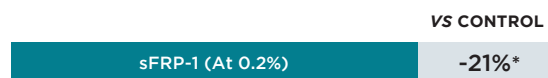
HAIRILINE® REDUCES ENDOTHELIN-1 SECRETION, IMPROVING BLOOD SUPPLY TO HAIR.

Hair loss is the result of premature entry into catagen due to various causes: **TGFβ-1** (Transforming Growth Factor 1) is a catagen inducer.

*Dermal papilla cells from a healthy donor (76 years old).
Treatment during 24h with HAIRILINE® at several concentrations. Protein quantification in the supernatant by ELISA. ** p<0.01, *** p<0.001 vs control*



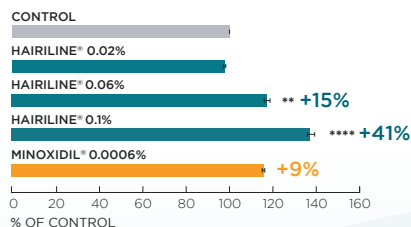
sFRP-1 protein is an inhibitor of Wnt signaling pathways, inducing hair-loss.



HAIRILINE® LIMITS THE SECRETION OF TGFβ-1 & PRODUCTION OF THE WNT ANTAGONIST SFRP-1, REDUCING HAIR LOSS.

• HAIRILINE® IS BETTER THAN MINOXIDIL CONCERNING PAPILLA CELLS PROLIFERATION

*Human follicle Dermal papilla cells (HFDP).
Treatment during 48h with HAIRILINE® or MINOXIDIL at several concentrations.
Cell proliferation was evaluated by MTT method.
** p<0.01, **** p<0.001, vs control.*



HAIRILINE® HAS INHIBITORY EFFECTS ON DKK-1 AND TGFβ-1 SECRETION & STIMULATES FOLLICLE DERMAL PAPILLA CELLS PROLIFERATION : NOT FOUND WITH MINOXIDIL.

TECHNICAL INFORMATIONS

FORMULATION

Concentration for use: 1-2%
pH for use: 4.0 - 6.0

Caution for use:

Add in formulations at 35-40°C, while cooling or at any time in cold preparation.

TECHNICAL DATA

Characteristics

Organoleptic

Appearance: liquid
Colour: amber to brown

Solubility

Ethanol: soluble with opalescence
Propanediol: soluble

Storage

Keep in a dark place, in the original packaging, at an ambient temperature between 15°C and 25 °C.

Tests of tolerance

- Cutaneous irritation: Very good skin compatibility
- Sensitization: Very good skin compatibility
- Eye irritation: Practically non-irritant

- Phototoxicity test: Not phototoxic
- Mutagenicity test: Not mutagenic

- INCI name:** Propanediol, Aqua, Linderia strychnifolia Root Extract
- Preservative:** None

- Authorized:** China
- Authorized:** COSMOS



Raw material approved by ECOCERT GREENLIFE, according to COSMOS Standard

Warning: The information in this document are the result of studies and interpretations based in part on published or generally accepted scientific data. They are provided for information purposes in terms of possible end applications and cannot be considered as instructions for use. We accept no responsibility concerning marketed formulas containing one or more of our products. Compounders must take all necessary precautions and ensure that all legal and administrative formalities have been fulfilled.

Edition, June 2020

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