

Active Beauty
ResistHyal™
Ultimate hair beauty enhancer

Crafted by white technology



Focus on the product

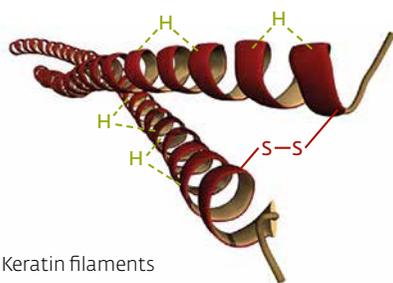
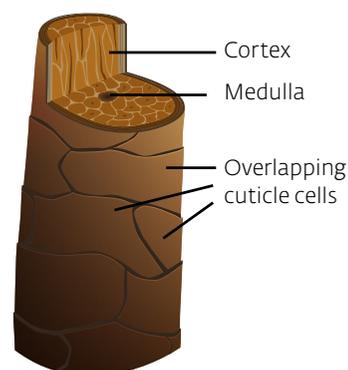
Hair is a reflection of our beauty

The first role of the hair is to protect the scalp from UV radiation. But, hair is so much more than that; it is also a reflection of our personality and overall attractiveness. It is not only a unique personal characteristic, it is also how other's perceive our health and particularly, our beauty. Shiny hair with a smooth texture and clean-cut ends is generally perceived to be appealing. However, because hair varies in its level of, and ability to hold, hydration, all hair types have varying needs in order to maintain hair health and appeal. From straight, to wavy, to curly, and everything in between, regardless of the sensitivity one's hair has to humidity, moisture, and the dreaded FRIZZ, one fact holds true: each hair type needs specific methods of care, but every hair type needs resistance to breakage, shine, volume, smoothness, and the maintenance of the desired shape.¹

The beauty of hair structure

The shaft is the dead visible part of the hair. Every single cell of the shaft is filled with keratin (fibrous protein which provides toughness and resistance). The shaft has a diameter comprised between 70µm and 100µm and possesses three layers:

- ▶ **The cuticle:** composed of 6 to 10 layers of big flat and lengthened cells which partially cover each other like roof tiles. It protects the cortex and offers water resistance, but it is also responsible for light reflection (shine) and smoothness.
- ▶ **The cortex:** made of very lengthened pigmented cells rich in keratin filaments and sealed together in the shaft direction. They are embedded in an amorphous matrix of high sulfur proteins. The cortex is the most important actor of the biomechanical properties of the hair.
- ▶ **The medulla:** a soft proteinaceous core present only in mature thicker and white hair.²



Keratin filaments

Irreversible change of hair shape: keratin filaments can twist around each other and maintain hair shapes by means of **di-sulfur bonds**. These covalent bonds can be permanently broken by a chemical perm treatment, which enables to reshape in an irreversible way the hair structure.

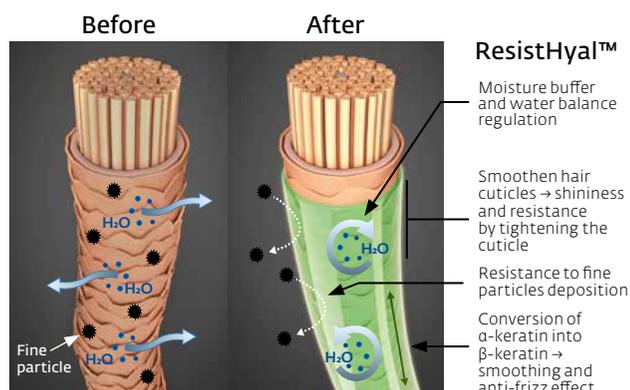
Reversible change of hair shape: keratin contained in the human hair is organised under an alpha helix ultrastructure. This helicoidal structure is stabilised by hydrogen bonds (weak bonds). Those **hydrogen bonds** can be easily broken by water (conversion of helix alpha into beta sheets) and mechanic hair styling tools to straighten hair in a reversible way.³

ResistHyal™ – the 7 in 1 active hair beautifier

ResistHyal™ is a new generation of hair care active ingredient containing an optimised ratio of low and high molecular weight hyaluronic acids, dissolved in a blend of water and lactic acid. Once applied on any type of hair (in leave on or rinse off products containing a cationic polymer such as guar), it creates a local moisture barrier all around the shaft, thereby favouring the conversion of alpha keratin into beta keratin to enhance the beauty of hair fibres.

Answering all key consumers' requests worldwide:

1. Hydration (local molecular moisture buffer)
2. Natural volume (sheathing effect)
3. Anti-frizz (beta keratin structure protection)
4. Resistance (tighten cells of the hair cuticle)
5. Anti-pollution (shield avoiding particles adhesion)
6. Shininess (flatten cuticle cells for better light reflection)
7. Suppleness (smoothing hair cuticle surface)

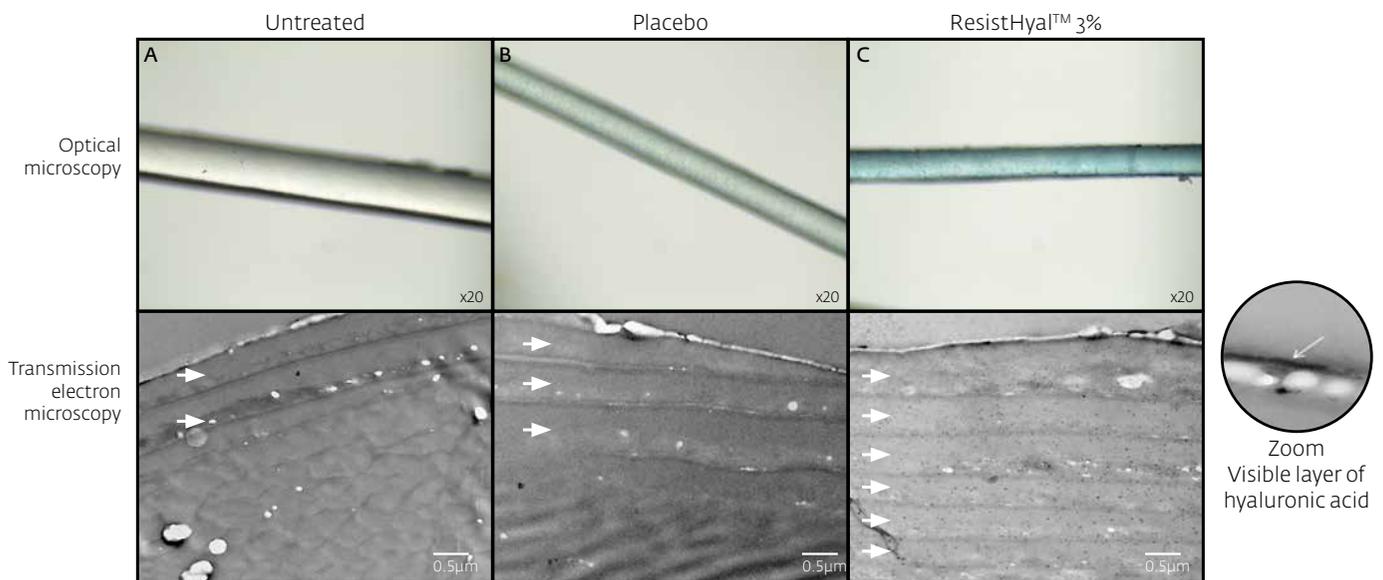


¹ Healthy hair. what is it? R.D. Sinclair. ² Chemical and physical Behavior of Human Hair. C.R Robbins. ³ Fundamentals of Anatomy and Physiology. D.C . Rizzo.

Biological activity

Sheathing effect of ResistHyal™ around hair fibre (ex vivo)

Three normal human blond Caucasian hair locks were washed with either water, a placebo shampoo or a shampoo with ResistHyal™ at 3%, and then dried. The locks were then incubated with a blue Alcian solution (which stains acidic polysaccharides, such as Hyaluronic Acids). The deposition of ResistHyal™ onto hair fibres was observed under both light microscopy and transmission electron microscopy.



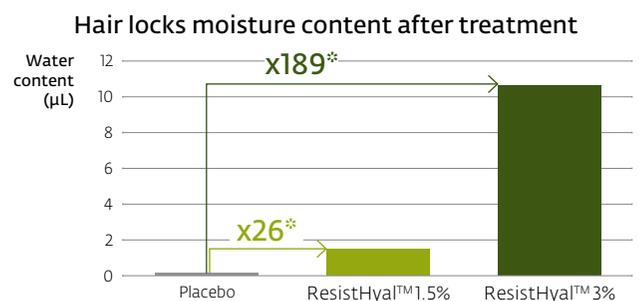
Results: The specific set of hyaluronic acids contained in ResistHyal™ remains onto the hair even after wash off and drying.

Under electron microscopy analysis, they can be clearly seen above the lipid layer of the cuticles. At the ultrastructural level, the hair treated with ResistHyal™ at 3% shows **thicker cuticles** (6 layers of flattened cells) than untreated or placebo conditions (2 to 3 layers), showing at the microscopic level the protecting effect of ResistHyal™ on the hair structure.

Biological hydration of hair fibre (ex vivo)

The hydration of the hair fibres was evaluated using a Tewameter TM300. Natural Human brown hair locks were treated with a placebo shampoo, a shampoo with ResistHyal™ at 1.5% or at 3%, and then rinsed and dried with a hairdryer.

Results: ResistHyal™ significantly increases the natural hair fibre hydration in a dose dependant manner. It brings up to **189 times** more hydration than the placebo.

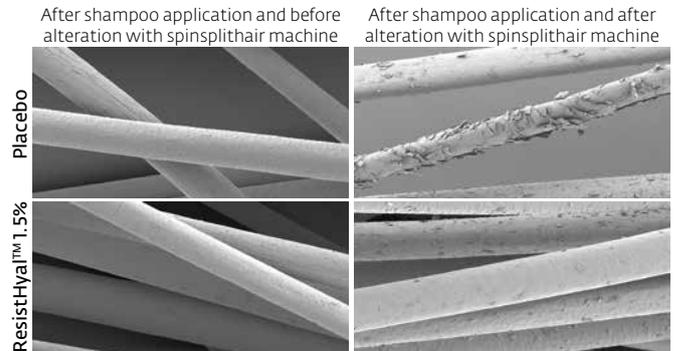
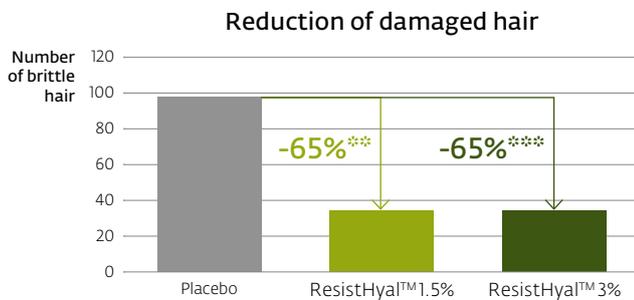


*p<0.05 (Student's t-test)

Efficacy

Resistance to mechanical and thermal stresses (*ex vivo*)

The protecting action of ResistHyal™ was evaluated by counting the number of brittle hair on Caucasian blond hair. The hair was first treated with a placebo shampoo, a shampoo with 1.5% ResistHyal™, or a shampoo with 3% ResistHyal™. Then, the hair was damaged using a specific device which reproduces brushing constraints (stretching, temperature, rotation) for one hour. The number of brittle hair was evaluated by an expert and the hair was observed with a scanning electron microscope.



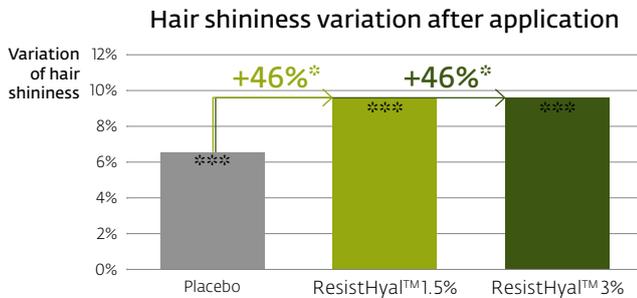
Results: ResistHyal™ increases the hair fibre resistance to mechanical and thermal stresses by protecting hair cuticles from lifting up. It reduces the number of brittle hair down to -65% compared to placebo.

**p<0.01, (Mann-Whitney test)

***p<0.001, (Mann-Whitney test)

Resistance to dullness: increased shininess (*ex vivo*)

The effect of ResistHyal™ on hair shininess was evaluated on Caucasian dark blond hair using non cross polarised photographs. Fifteen hair locks were treated either with a placebo shampoo, a shampoo with ResistHyal™ at 1.5% or a shampoo with ResistHyal™ at 3%. Pictures were taken before and after product application.



Visual benefits (ResistHyal™ 1.5%)



Results: ResistHyal™ at both 1.5% and 3% significantly increases hair shininess, with up to +46% glossiness compared to placebo. This effect is connected with the smoothing properties of ResistHyal™ on cuticles, giving a better light reflection.

*p<0.05, (Student's t test)

***p<0.001, (Student's t test)

Efficacy

Resistance to frizzing: hair straightening enhancement (*ex vivo*)

The increase of moisturisation into the hair fibre favours the conversion of alpha keratin into beta keratin which helps to maintain hair's straight shape and avoids curls and frizz.

The anti-frizz property of ResistHyal™ was evaluated on human natural curly hair using photographs and image analysis to measure the length of the hair strands.

The hair locks were washed with either :

- ▶ Water (untreated conditions)
- ▶ A placebo shampoo (control)
- ▶ A shampoo containing the low molecular weight hyaluronic acid of ResistHyal™ (LMW HA)
- ▶ A shampoo containing the high molecular weight hyaluronic acid of ResistHyal™ (HMW HA)
- ▶ A shampoo containing 1.5% of ResistHyal™
- ▶ A shampoo containing 3% of ResistHyal™

The hair locks were then smoothed and placed in extreme humidity conditions (relative humidity = 80%) for 8 hours.

Results: ResistHyal™ decreases significantly the spontaneous frizzing of straightened hair. Smoothing is increased up to +25% vs untreated hair and +11% vs placebo at 3% of use, even in extreme humidity condition. The anti-frizz properties of ResistHyal™ are very specific to its intrinsic composition as none of its individual components gave an equivalent result.

*p<0.05, (Student's t test, vs placebo)

**p<0.001, (Student's t test, vs untreated)



Efficacy

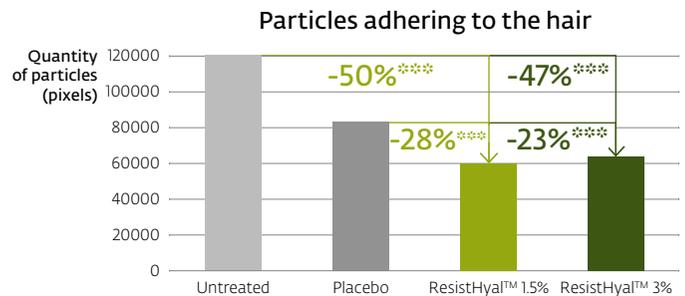
Resistance to pollution: anti-adhesion properties (*ex vivo*)

The efficacy of ResistHyal™ as an anti-pollution active was evaluated by measuring the quantity of pigment particles able to adhere to the hair. These particles were chosen as a model for atmospheric pollution (average size of 1 micron). The test was run on 21 hair locks in each case, which were left untreated, treated with a placebo, or treated with a shampoo with ResistHyal™ at 1.5%. The studied zones were then visualised with a video-microscope, and the surface covered by particles was measured by image analysis.

Results: ResistHyal™ prevents the particles from adhering to the hair, providing an anti-pollution barrier effect.

Quantity of particles adhering to the hair is decreased down to -50% vs untreated hair, and down to -28% vs placebo.

***p<0.001 (Student's t test)



Global hair beauty enhancement in a rinse off (user test #1)

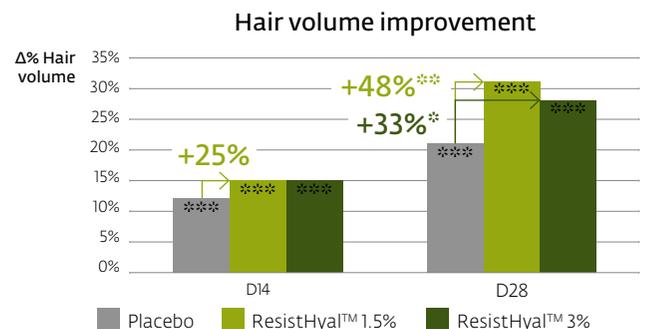
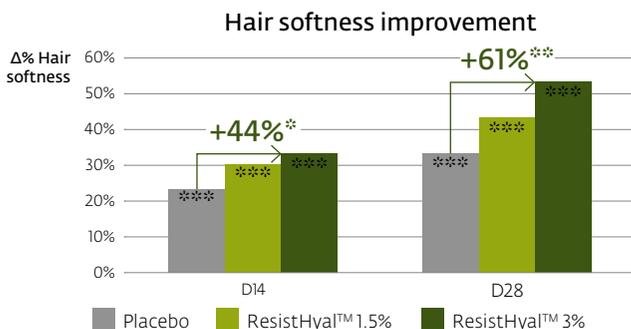
The efficacy of ResistHyal™ on hair beauty parameters was evaluated in user tests in a double blind study versus placebo. Seventy one Caucasian women volunteers (more than 18 years old) with damaged hair (dull, dry, lack of volume) took part in the study.

The clinical test was run during summer time, in normal conditions. The volunteers used twice a week either a placebo shampoo (23 volunteers), or a shampoo with ResistHyal™ at 1.5% (24 volunteers) or a shampoo with ResistHyal™ at 3% (24 volunteers) during 28 days.

1. Professional evaluation by a hairdresser

After 14 and 28 days a professional hairdresser assessed the overall hair beauty and appearance using:

- ▶ Hair softness: scale from 1-rough/stiff to 10-soft/elastic/supple
- ▶ Hair volume: scale from 1-lack of volume to 10-lots of volume



Results: ResistHyal™ at 3% shows a significant **improvement of hair softness** up to +44% after only 14 days, and up to +61% after a month, *versus* placebo. ResistHyal™ at 1.5% and 3% shows a significant **improvement of hair volume** up to +48% after a month, *versus* placebo.

*p<0.05, (Student's t test) **p<0.01 (Student's t test) ***p<0.001 (student's t test)

Efficacy

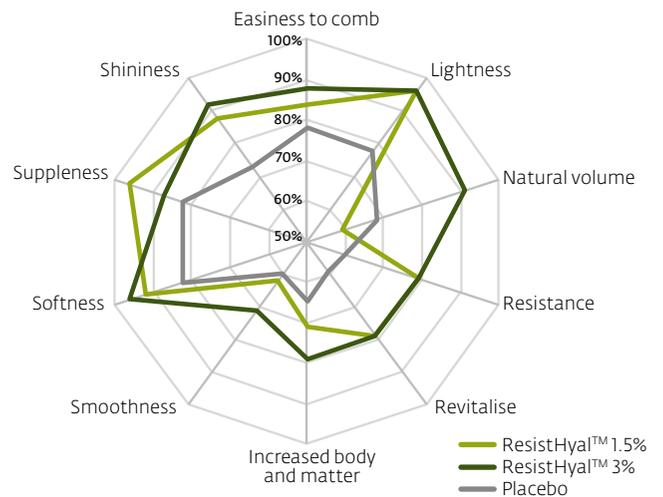
2. Consumers assessment

After 28 days the volunteers were invited to answer a questionnaire regarding their hair beauty improvement.

Results: ResistHyal™ at 1.5% and 3% improves significantly the self perception of the beauty parameters of the hair of the panellists within 28 days.

96% of volunteers who have tested the shampoo ResistHyal™ at 3% wanted to continue to use the product.

Perceived consumers' benefits after 28 days



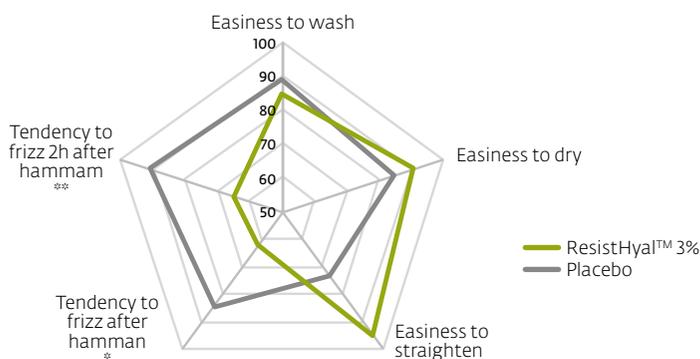
Anti-frizz and beautifying effects in a rinse off (user test #2)

The efficacy of ResistHyal™ on hair beauty and anti-frizz resistance was evaluated in user tests in a simple blind study versus placebo on nine Caucasian women volunteers (over 18 years old) having a hair straightening morning routine. The clinical test was run during autumn time, in extreme humidity conditions. The volunteers applied in a single application the placebo shampoo or the shampoo with ResistHyal™ at 3%. Each volunteer tested both products in a random order. The hair was straightened, then the volunteers were exposed to extreme humidity (100% humidity at 43°C) in a hammam for 20 minutes.

Macrophotographies of the hair were taken:

- ▶ Immediately after shampoo
- ▶ After hair straightening
- ▶ Immediately after hammam session

Consumer's benefits after a single use



Results: ResistHyal™ at 3% increases the easiness to straighten hair and their resistance to spontaneous frizzing even under very high humidity conditions. It gives a natural volume and movement avoiding the classical too rigid effect of straightened hair.

*p<0.05 (Student's t test), **p<0.01 (Student's t test)

Summary



Technical information

Suggested INCI:	Water (and) Sodium Hyaluronate (and) Hydrolysed Hyaluronic Acid (and) Phenoxyethanol (and) Lactic Acid
Origin:	White biotechnology (fermentation)
Preservation:	Phenoxyethanol
Appearance:	Viscous opalescent liquid
Solubility:	Water soluble
Dosage:	1.5-3%
Processing:	Can be added at the end of the formulation process, under gentle stirring. Can be added to the water phase. Formulate at temperature below 80°C, and pH between 4 and 8. Formulate with a cationic polymer to obtain optimal efficacy.

Claims

Claims:	Natural volume enhancer, anti-frizz protection, mechanical and thermal protection, straightening enhancer, hair resistance increase, hair shininess booster, biological hair hydration, hair softness enhancer, antipollution.
Applications:	Shampoo, anti-frizz hair spray, beauty hair mask, hair shininess serum, hair conditioner, hair strengthener pre-shampoo, hair protection lotion, antipollution conditioner.

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