VECTICELL HA

synthos CARE

Hyaluronic acid (HA), and more specifically its sodium salt, is a substance with special physicochemical and biological properties. It was discovered in 1934 by Karl Meyer and John Palmers, and in 1982, hyaluronic acid of animal origin was used for the first time in cosmetics. Currently, it is obtained by biotechnological methods using strains of bacteria of various types.

Hyaluronic acid occurs naturally in the human body, 50% of which is in the extracellular matrix in the skin. It exhibits an exceptionally high ability to bind water molecules, thanks to which it determines the proper hydration of tissues, and on the surface of the skin, it creates a hydrophilic film protecting against external factors and impeding transepidermal water loss (TEWL). It also stimulates proliferation of fibroblasts, thus supporting the production of collagen fibres, thanks to which it is possible to accelerate the healing of wounds and prevent skin-ageing processes. The presence of hydroxyl groups in hyaluronic acid molecules ensures an antioxidant effect.

The properties of hyaluronic acid in cosmetics depend on its molecular weight and hydrophilic character, which has a direct effect on penetration through the epidermis. High molecular weight hyaluronic acid does not penetrate the stratum corneum and acts on the surface of the epidermis to form a hydrophilic protective film. Low molecular weight hyaluronic acid is characterised by limited penetration through the stratum corneum. A small amount of it reaches the living layers of the epidermis and rebuilds its structure, contributing to long-lasting skin hydration, and faster healing of wounds and bruises. Unfortunately, even the smallest molecules of hyaluronic acid do not penetrate the epidermis, and therefore do not reach fibroblasts. Due to its size, its hydrophilic nature and its lack of affinity to the lipids of the epidermis, penetration is very limited.

VECTICELL HA is a mixture of two types of hyaluronic acid: low molecular weight HA, closed inside the carrier, which is intended to increase its ability to penetrate the epidermis and build into the structure of intercellular cement, and a high molecular weight covering the carrier membrane. During application, particles with a mass of $5x\ 10^4$ - $1x\ 10^5$ Da accumulate on the surface of the epidermis, where, thanks to strong hygroscopic properties, they form a hydrophilic film protecting against water loss, smoothing the epidermis and filling small furrows and lines of wrinkles from the outside. On the other hand, HA molecules with a significantly lower mass, of 3,000 - 5,000 Da, penetrate the epidermis, stimulating fibroblasts to produce collagen and physiological hyaluronic acid. An increased amount of HA in the skin is a very good scaffold for collagen and elastin fibres, and also ensures optimal hydration of cells. Thanks to this, the skin is elastic, firm, smooth, and resistant to external factors. Additional protection for dry and non-elastic skin is provided by the lipid carrier coating, compatible with the ingredients of the skin's lipid coat.

The advantages of using VECTICELL HA

- Comprehensive, multidirectional hydration
- A double effect obtained simultaneously
- Effect at the level of fibroblasts - an increase of the amount of physiological hyaluronic acid in the skin

In vitro studies

The effectiveness of hyaluronic acid on the skin is determined by its **ability to penetrate the epidermis and affect the cells in the dermis**. Larger HA molecules with lower bioavailability stop at the surface of the epidermis, forming an occlusive layer which limits TEWL. However, the effect of this action is short and decreases over time. The target area of hyaluronic acid are the deeper layers of the epidermis, and above all the dermis, where it physiologically occurs in the largest amount. Our research proves the complementary effect of the VECTICELL HA delivery system when applied to the skin.

The penetration of hyaluronic acid

The advantages of increased permeability of hyaluronic acid in the VECTICELL HA delivery system have been demonstrated in a study where human skin was treated with VECTICELL HA and free hyaluronic acid, which is a mixture of HA particles corresponding to the mixture used in VECTICELL. Hyaluronic acid marked with a fluorescent dye was used as a penetration marker. The skin with the applied preparation was then incubated for 3 minutes. After the preparation was removed from the skin surface, a permeability analysis was performed on the cross-sections. Micromapping measurements were made on a Raman spectrometer equipped with a confocal microscope.

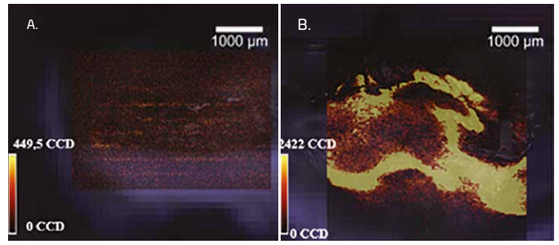


Figure 1: The permeability of hyaluronic acid marked with a dye (yellow areas in the picture):

A. Free form of hyaluronic acid

B. VECTICELL HA

Results:

A study conducted on a fragment of the skin from the torso showed a marginal level of penetration of free hyaluronic acid through the skin layers. Hyaluronic acid encapsulated in VECTICELL HA is visible in the layers of dermis at a depth of 2,900 µm. The maximum penetration depths for three VECTICELL HA-marked dye samples are shown in Figure B.

In vivo studies

In vivo studies constitute a translation of in vitro studies onto a living organism and confirm the actual effect of VECTICELL HA on the skin. For this purpose, **application and apparatus** tests were performed.

VECTICELL HA vs free hyaluronic acid

A comparative study was carried out of the effect of VECTICELL HA carriers and a solution of free hyaluronic acid with a concentration and size of HA molecules corresponding to those used in VECTICELL HA. 5 participants took part in the study. Hydration and TEWL measurements were made using a tewameter, before and after 1h, 3h and 5h from the application of the formulations.

The increase in the level of skin hydration after using VECTICELL HA

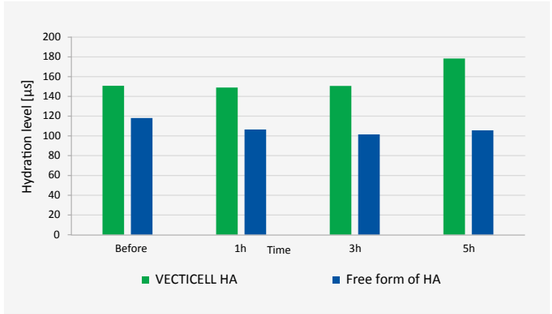


Figure 2: Skin hydration after using VECTICELL HA and free HA

Results:

Five hours after the application of pure VECTICELL HA, a **significant increase in skin hydration** was found, an average of **18%**. This confirms the effect of VECTICELL HA over time and the gradual release of hyaluronic acid from the carrier in the deeper layers of the skin. After using a solution of free hyaluronic acid, a decrease in skin hydration by 11% was observed.

Reduction of transepidermal water loss for VECTICELL HA

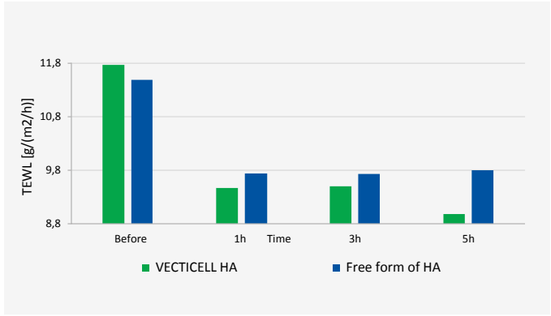
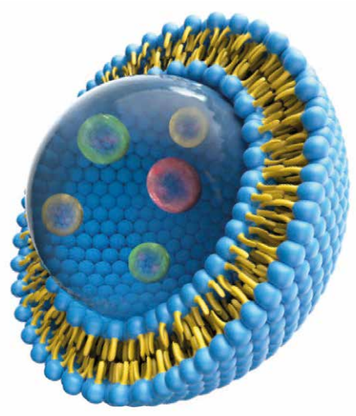


Figure 3: TEWL after using VECTICELL HA and free HA

Results:

The study confirmed a **significant decrease in TEWL** after using the VECTICELL HA carrier. TEWL decreased by **24%** after 5 hours of VECTICELL HA application, and in the case of free hyaluronic acid a significantly lower (15%) TEWL reduction was observed. It has been proven that VECTICELL HA provides a high level of protection against the loss of water from the epidermis.



Cream with 5% VECTICELL HA

A study for a cream* containing 5% VECTICELL HA was carried out in an independent research laboratory on a group of 30 women. The cream was applied twice a day, in the morning and in the evening, on cleansed facial skin for 4 weeks. In this time, the subjects restrained from using any other products with the same or equivalent intended use during the test.

VECTICELL HA improves and maintains a stable skin hydration level

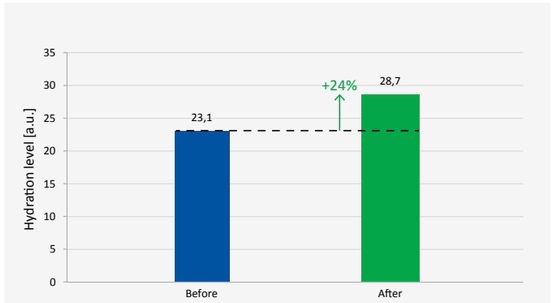


Figure 4: Increased skin hydration after using 5% VECTICELL HA cream

Results:

In the apparatus measurement of hydration carried out after one month of applying a cream with 5% VECTICELL HA, a **significant improvement in skin hydration** was observed, by **24%** on average. The performed tests clearly confirm the high effectiveness of VECTICELL HA in the comprehensive hydration of the skin, which is maintained over time and indicates the effect of hyaluronic acid in the deeper layers of the skin. An invisible film on the surface of the epidermis formed by high molecular weight HA **reduces the TEWL** value by an average of **16%**, which has a direct effect on the suppression of transepidermal water loss.

VECTICELL HA improves skin elasticity

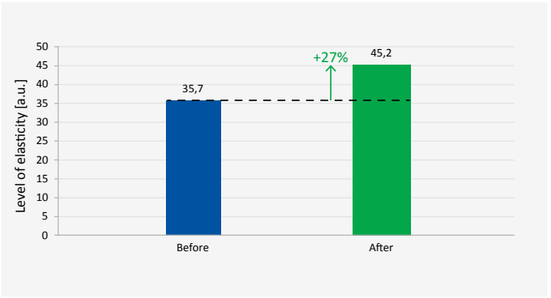


Figure 5: The level of skin elasticity after applying the cream with 5% VECTICEL HA

Results:

In the skin elasticity measurements, it was confirmed that VECTICELL HA, thanks to the perfect hydration of even of the deeper layers of the skin, contributes to the **increase of its elasticity**, on average by **27%**. It creates an ideal, hydrated environment in the extracellular matrix for collagen and elastin fibres, thanks to which the skin regains its firmness and elasticity.

***INCI Cream with 5% Vecticell HA:**

Aqua/Water, Glycerin, Black Currant Seed Oil/Olive Oil/Aminopropanediol Esters, Caprylic/Capric Triglyceride, Glyceryl Stearate, Phosphatidylcholine, Hydrogenated Phosphatidylcholine, Butyrospermum Parkii Butter Unsaponifiables, Sodium Hyaluronate, Propylene Glycol, Disodium EDTA, Tocopheryl Acetate, Acrylamide/Sodium Acrylate Copolymer, Paraffinum Liquidum, Trideceth-6, Dehydroacetic Acid, Benzyl Alcohol

VECTICELL HA smoothes the skin

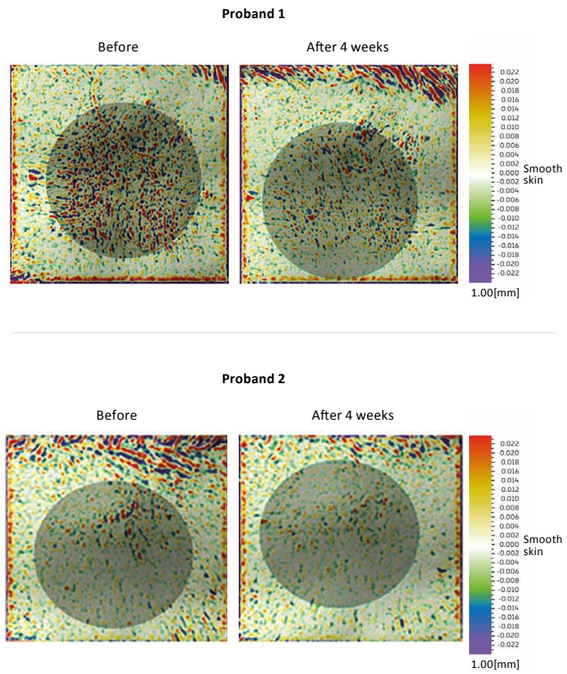


Figure 6: The effect of cream with 5% VECTICELL HA on skin smoothing

Results:

Measurements of skin smoothing after 4 weeks of using the cream with 5% VECTICELL HA have shown a visible **increase in skin smoothness**, on average by **8%**. The presented photos of the skin of test subjects clearly confirm the significant smoothing of the skin surface, and a reduction of the number of furrows and unevenness of the epidermis. Appropriately hydrated skin regains elasticity, firmness and smoothness.

Summary

The conducted in vitro and in vivo studies confirm the effectiveness of VECTICELL HA in intensive and long-lasting skin hydration, a significant reduction of transepidermal water loss, elimination of roughness, and visible improvement of skin elasticity. This effect is conditioned by the ability of VECTICELL HA to penetrate into the dermis. Products containing VECTICELL HA can be recommended for the daily care of dry skin with a tendency to lose elasticity, with signs of ageing.

Product description

A viscous, opalescent solution.

Appearance

An opalescent milky to yellow-milky coloured solution.

INCI

Aqua/Water, Phosphatidylcholine, Propylene Glycol, Sodium Hyaluronate, Tocopheryl Acetate, Dehydroacetic Acid, Benzyl Alcohol.

Storage conditions

The product should be stored in its original packaging. It is necessary to store the product indoors, protected from direct sunlight, at a temperature not exceeding 5-25°C.

Shelf life

18 months from the production date.

Recommended formulation conditions

Shake the product **every time before applying**. It is recommended to add the raw material to the final product at the final stage of production, at a temperature not exceeding 35°C. Optimal pH of the formulation during the addition of the raw material: 4.0 - 7.0. An alkaline pH is inadvisable.

Soluble in water.
Recommended **concentration**: 3% – 5%.

VECTICELL

delivery system

Synthos CARE
Synthos Dwory 2
Spółka z ograniczoną
odpowiedzialnością
Spółka komandytowa

ul. Chemików 1, 32-600
Oświęcim, POLAND

Customer Support Centre
Tel. +48 33 847 42 47
Fax. +48 33 847 42 47

Sales Department
Tel. +48 885 800 398

care@synthosgroup.com
www.synthoscare.com