D.S.H. C N®
D.S.H. C®

EXSYMOL

INCI name : DIMETHYLSILANOL HYALURONATE
Ingredient code CLS : 532260

Origin

D.S.H. C® is a SILANOL obtained by condensation of a synthetic derivative of silicon on sodium hyaluronate, and chondroitin sulfate (mucopolysaccharides). Sodium hyaluronate is obtained by fermentation and mucopolysaccharides are obtained by extraction from bovine cartilages.

D.S.H. C N® is obtained by the same reaction between the derivative of silicon and sodium hyaluronate. It does not contain any mucopolysaccharide but double quantity of biotechnology sodium hyaluronate.

D.S.H. C N® : the non-animal alternative of D.S.H. C.®

Analytical composition

	D.S.H. C®	D.S.H. C N®
dimethylsilanediol	0.3%	0.3%
of which silicon is	0.09%	0.09%
mucopolysaccharides	1.5%	0.0
sodium hyaluronate	0.15%	0.3%
water sq	100.0%	100.0%

Technical characteristics

slightly yellow, limpid liquid
pH : around 4.8
density at 20° C : around 1
miscible with water, alcohol and glycols

Availability

5, 30 or 60 kg drums
D.S.H. C® and D.S.H. C N® are also available as NANOSPHERES 100 (NANOSPHERES 100 D.S.H. C® (SA) & NANOSPHERES 100 D.S.H. C N® (SA))

Uses

Face and body moisturizers
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Anti-ageing : prevention and reparation
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Anti-free radical activity
(products for skins prone to acne, sensitive skins, babies and children, sun and after-sun products, after-shaves, depilatory products...)
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Body-firming and bust-firming products
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Anti-stretch mark products
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Hair care : moisturizers, shampoos, lotions

BIOLOGICAL ACTIVITIES

Evaluation of moisturization *in vivo*

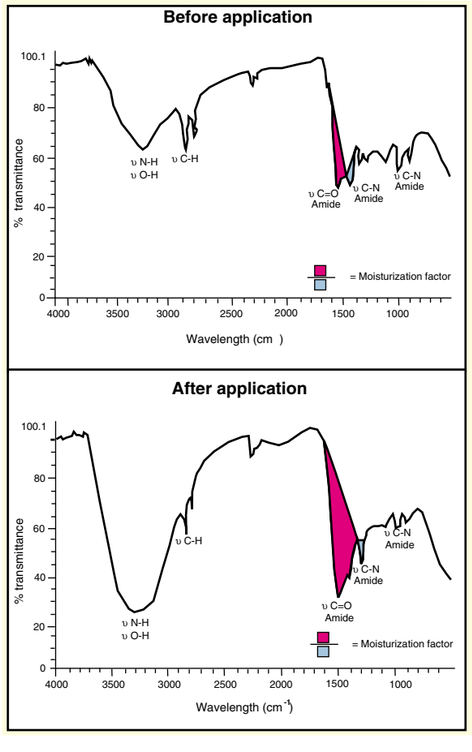
Water in the epiderm is found in either free or bonded form. Free water is very mobile and evaporates easily ; there is an imperceptible water-loss evaluated at approximately 600 ml every 24 hours under normal conditions. Interactions (hydrogen bonds) are created between water molecules and keratin : the resulting bonded water forms the largest fraction as it is less subject to mobility.

In cosmetology, the concept of moisturization has become fundamental. With this aim in mind, different molecules are used whose chemical structure allows the formation of hydrogen bonds, thus increasing bonded water and fighting against dehydration. Moisturization is evaluated by various methods, particularly in humans.

Both the plasticity and elasticity of the skin depend a great deal on its water-content which varies considerably according to the layer in question, the *stratum corneum* in particular. Here, the deep derm contains 65-70 % water, the deep layers of the epiderm approximately 40 %, whereas the *stratum disjunctum* (the most superficial part of the *stratum corneum*) normally contains 13 %; less than 10 % means dehydration. The regulation of moisturization, which involves the superior layers of the epiderm, is ensured by three factors : the surface hydrolipidic film, intra-cellular cement and the NMF which is made up of hygroscopic compounds contained in the corneocytes.

When using **corneometry** to evaluate an increase in moisturization over a period of time, after the application of various products the best results are achieved with 6 % D.S.H. C®. The presence of **D.S.H. C®** in propylene glycol or a very simple emulsion **increases moisturization by 11 % after 10 mins and approximately 30 % after 3 hours**. The diluent itself has an immediate moisturizing effect, although this lasts no longer than 3 hours after application.

Other methods were used to evaluate **cutaneous roughness, elasticity and desquamation** after a week of daily applications of a detergent, followed by 10 daily applications of 6 % D.S.H. C or the excipient. **The above three criteria are improved by 20 to 30 % with D.S.H. C®** compared to the excipient alone.



Infra-red spectroscopy

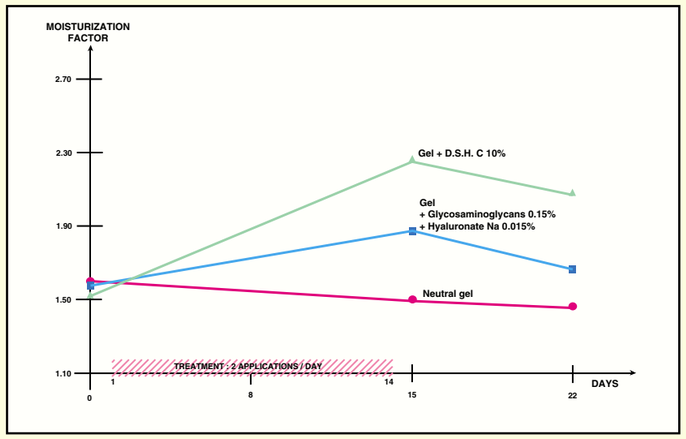
The spectral properties of proteins are modified by the thermodynamic equilibrium established with the water molecules bonded to them. Infra-red spectroscopy measures the contribution of water molecules on the vibrations of certain polar functions in the proteins :

- at around 1650 cm^{-1}, we observe "stretching" vibrations in the C=O carbonyl groups of the amide functions in the peptidic bonds ;
- at around 1550 cm^{-1}, vibrations due to the CNH groups (particularly the "stretching" vibrations of the CN bond) appear. Contrary to the former vibrations, these are insensitive to hydrogen bonds, thus constituting a reference.

The cutaneous spectrum is very complex ; to study any changes in moisturization, it is necessary to isolate the appropriate vibrations with a special technique known as Fourier Transform, which associates the derivation and deconvolution.

Changes in moisturization induced by the application of different products are evaluated by calculating a variable "moisturization factor", which is determined by the ratio of the integrated areas corresponding to the vibrations being studied.

The moisturization level is measured by placing the inside of the forearm on the crystal and maintaining constant pressure. The test was conducted on 7 subjects who applied a neutral gel, one containing 10 % D.S.H. C® or one containing an equivalent quantity of glycosaminoglycans every day for 2 weeks. Measurements were taken before the experiment, again after two weeks and finally one week after stopping the treatment. A very good moisturizing effect was observed with D.S.H. C® at the time of application, although a remaining effect was also observed as can be seen in the diagram opposite.



D.S.H. C® moisturizes the skin very well. The SILANOL structure, rich in hydroxyl groups, establishes hydrogen bonds with both free and bonded water, creating a dynamic equilibium in the epiderm : the resulting moisturization is both immediate and lasting. The glycosaminoglycan structure of the hyaluronic radical also participates in the fixation of water in the tissues.

Cytostimulating effect on fibroblasts

Over a period of time, collagen insolubilizes, elastin disappears and cross-links between macromolecules are created, thus reducing the tonicity and elasticity of the connective tissue. Simultaneously, the fibroblast metabolism slows down : the derm deteriorates, the dermo-epidermic junction smooths out and fine lines appear, followed by wrinkles.

Cell cultures, particularly fibroblasts, are often used to evaluate the role played by molecules in cutaneous aging : artificially "aged" cells are created when a culture medium is depressed by depleting the foetal calf serum (FCS) which contains numerous mitogenic factors.

The test consists in comparing the number of cells obtained after a 48 hour culture under different environmental conditions :

- normal medium containing 10% FCS,
- depressed medium containing 3% FCS (Reference),
- depressed medium containing 3% FCS and D.S.H. C® at 1 % or 3 %.

The cell count is obtained by determining the radioactivity rate 3 days after incubation with tritiated thymidine, this having been added to the culture medium after the first 48 hours (see above).

Solution being tested	cpm (mean ± standard deviation)
Reference	22.6 ± 5.6
1 % D.S.H. C	202.0 ± 77.9 ($p < 0.01$)
3 % D.S.H. C	215.3 ± 57.5 ($p < 0.01$)

The radioactivity values are a direct reflection of the cell growth rate. When D.S.H. C® is present, at any concentration whatsoever, the number of counts/minute (cpm) is increased significantly.

D.S.H. C® has a cytostimulating effect on fibroblasts : it is an active which can be used in any product for preventing or reducing alterations in the skin for whatever reason (ageing, pregnancy, sun, etc...).

Tolerance study

The tests performed showed that D.S.H. C® & D.S.H. C N® are neither toxic nor irritant.

Their tolerance has been studied *in vitro* by alternative methods on both cell culture and reconstituted epidermis. The ocular tolerance is evaluated by studying the cytotoxicity on cornea-isolated fibroblasts culture. The cutaneous tolerance is evaluated on reconstituted epidermis by measure of the cell viability after a contact period of 24 hours with the product.

Formulation

D.S.H. C® & D.S.H. C N® are hydrosoluble and stable for a pH included between 4 and 7. On average, the recommended concentration is 4 to 6 %. The products must not be heated to above 60°C for reasons of stability.

Important remark : D.S.H. C® & D.S.H. C N® must not be stored at temperatures inferior to 0°C otherwise an irreversible polycondensation would occur.

Existing studies

A complete file includes :

Technical document

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Cosmetic activities

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Evaluation of moisturization by corneometry

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Evaluation of moisturization *in vivo*

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Evaluation of moisturization by infra-red spectroscopy

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Study of cytostimulation *in vitro* : fibroblast culture

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Tolerances

EXSYMOL S.A.M. - 4 avenue du Prince Héréditaire Albert - MC 98000 MONACO
Tél. : +377 92 05 66 77 - Fax : +377 92 05 25 02
E-mail : exsymol@exsymol.com - Internet : http://www.exsymol.com

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