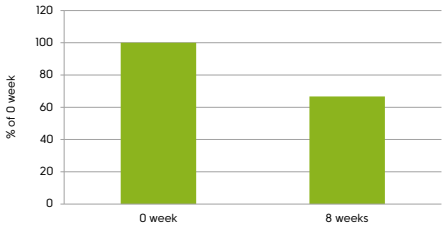
CONTIPRO

TENNELIDERM®

Tenneliderm is hyaluronic acid chemically modified by hexanoic acid. The acylation of hyaluronic acid changes its biological properties, facilitating the new application of this active ingredient. From a technological point of view, there is a substantial change in physico-chemical properties, accompanied, in particular, by increased solubility in less polar solvents.

Reduced redness of the skin by controlling the immune response

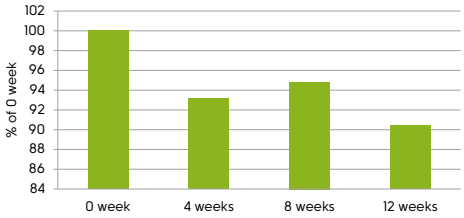


Skin spots reduction after 0.005% Tenneliderm treatment, 8 volunteers treated (25-40 years) +29 volunteers control group, Daily application for 8 weeks, Measured by VisioFace

Skin exposure to UV radiation in sunlight is manifested by characteristic reddening. In aging skin, this condition often becomes chronic and the skin, besides reddening, becomes itchy and more sensitive.

In an *in vivo* study, Tenneliderm demonstrated its ability to reduce skin redness in the treated volunteers by 30%.

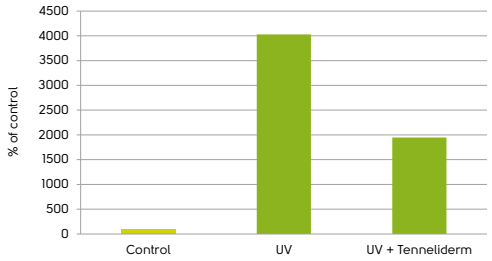
Reduced oiliness of the skin by affecting intercellular communication



Sebum production normalization by 0.005% Tenneliderm; 8 volunteers treated (25-40 years) + 29 volunteers control group, Daily application for 12 weeks, Measured by MPA 580; Glossymetry

As demonstrated during the *in vivo* study, Tenneliderm helps to normalize sebum production and therefore reduce the oiliness and shininess of the skin. In a group of 37 volunteers aged from 25 to 66, a reduction of sebum on the surface of the skin by 10% was observed.

Mechanisms of action



Anti-inflammatory effect of 0.1% Tenneliderm 24 hours after 10 mJ/cm² UVB radiation on HaCaT keratinocytes, n = 3, Measured by ELISA

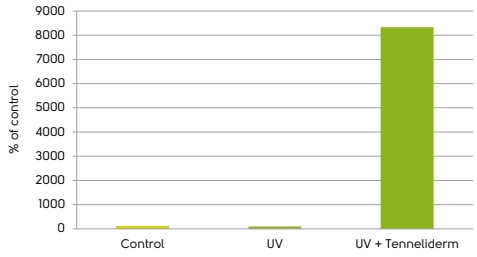
Skin redness after sun exposure is caused by the immune response of skin cells to UV radiation. In this response the cells produce proinflammatory cytokines, such as the interleukin (IL) 1, 6 and 8, which is manifested by red and itching skin.[1]

With increasing age and recurring induction of the inflammatory response, the level of cellular immunity decreases, resulting in the chronic production of interleukins.[2] Tenneliderm helps suppressing the immune response of keratinocytes to UV radiation by limiting IL production.

At the same time, after UV radiation irradiation Tenneliderm stimulates the production of basic fibroblast growth factor (bFGF), a potent activator of cell proliferation and angiogenesis.

In this respect, Tenneliderm helps restoring aging skin, which is prone to a lower number of cells and their reduced ability to proliferate.

Mechanisms of action



The effect of 0.1 % Tenneliderm on bFGF production 24 hours after 10 mJ/cm² UVB radiation on HaCaT keratinocytes, n = 3, p ≤ 0.05, Measured by ELISA

Sebum production by sebocytes is regulated by many factors. The effects of the overproduction of sebum on the skin are both aesthetic, in the form of increased shininess, and metabolic, manifested as the skin's reduced ability to breathe. These problems are related to the poor regulation of lipid production in sebaceous cells. Increased production of beta-bFGF is known to lower the activity of sebaceous cells and thus reduce the formation of sebum.[3]

Tenneliderm has demonstrated an ability to stimulate beta-bFGF production in keratinocytes, a process which affects sebocytes through intercellular communication. Sebum production decreases and the appearance of the skin is tidied up.

All data were obtained in the relevant *in-vivo* and *in-vitro* measurements and, subject to registration, can be accessed at www.contipro.com/anti-aging

SPECIFICATION: **Tenneliderm®**

Origin	semi-synthetic
Appearance	white to slightly yellowish powder or granules
Identification – NMR	structure confirmed
Loss on drying (%)	≤ 10.0
pH of 0.5% aqueous solution	5.0 – 7.0
Degree of substitution – NMR (% [mol/mol])*	50 – 80
Microbial contamination (CFU/g)	≤ 100

* The degree of substitution (DS) corresponds to the number of moles of bonded fatty acid over the number of moles of all dimers, multiplied by 100

SOURCE

- low molecular weight hyaluronic acid obtained by fermentation is chemically modified by original method.
- non-GMO
- non-animal materials used during the manufacturing process

SOLUBILITY

- fully soluble in water. Speed of dissolving depends on molecular weight and degree of substitution. Tenneliderm with low degree of substitution dissolves quicker.
- soluble in a mixture of ethylalcohol, isopropylalcohol, propylene glycol and butylene glycol or glycerol with water up to ratio 2:1
- insoluble in non-water miscible solvents

COMPATIBILITY AND PROCESSING

- sensitive to heat. Solution heating to 60 °C for 60 min. can lead to the molecular weight decrease up to 20% and degree of substitution decrease up to 25%.
- sensitive to low and high pH. Extreme values lead to decomposition, which is further enhanced by product heating.
- incompatible with cationic substances, e.g. surfactants or polymers (Polyquarternium-4, Polyquarternium-10, etc.)
- foaming in case of higher degree of substitution

TOXICOLOGY

- non-irritating
- non-cytotoxic

Literature

[1] Stamatas, G. N., A. P. Morello, 3rd, et al. (2013). "Early Inflammatory Processes in the Skin." Curr Mol Med

[2] Chung, H. Y., M. Cesari, et al. (2009). "Molecular inflammation: underpinnings of aging and age-related diseases." Ageing Res Rev 8(1): 18-30

[3] Akimoto, N., T. Sato, et al. (2002). "Cell proliferation and lipid formation in hamster sebaceous gland cells." Dermatology 204(2): 118-23

Version: P-01/2014

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