INGREDIENT

innovation
by pHformula **FOCUS**

VCR
24 HOUR
cream

#ABC line - moisturisers

The ABC of skincare redefined.

VITA A, VITA B^3, VITA C, and now our new VCR cream—each a powerful, stand-alone moisturiser within the pHformula alphabet collection.

Imagine the best of four worlds, each in its own advanced Vitamin moisturiser. It's simplicity at its finest, with maximum efficacy at exactly the right concentration levels.

Formulated with cutting-edge ingredients like RETINOL, NIACINAMIDE, VITAMIN C, and a D BOOSTER, these creams provide targeted skincare formulations to address your skin's unique needs.

Each moisturiser is developed with its own texture—from lightweight to rich, delivering rapid absorption and prolonged hydration. But what truly makes this line extraordinary is how each formula works in synergy with our recoveries and serums, offering a holistic approach to advanced skincare.

This is professional skincare at its best—effortless and designed to deliver visible results.

VCR cream a new addition to the ABC line.

The new VCR cream is an innovative moisturiser that blends Ascorbyl Tetraisopalmitate with a D Booster Complex, Triple Biotic Complex, and a 24-Hour Moisturising Complex. Ideal for all skin types and especially formulated for dry skin. Its rich texture hydrates, leaving your skin feeling soft and comfortable while boosting brightness and radiance for a vibrant, healthy glow.

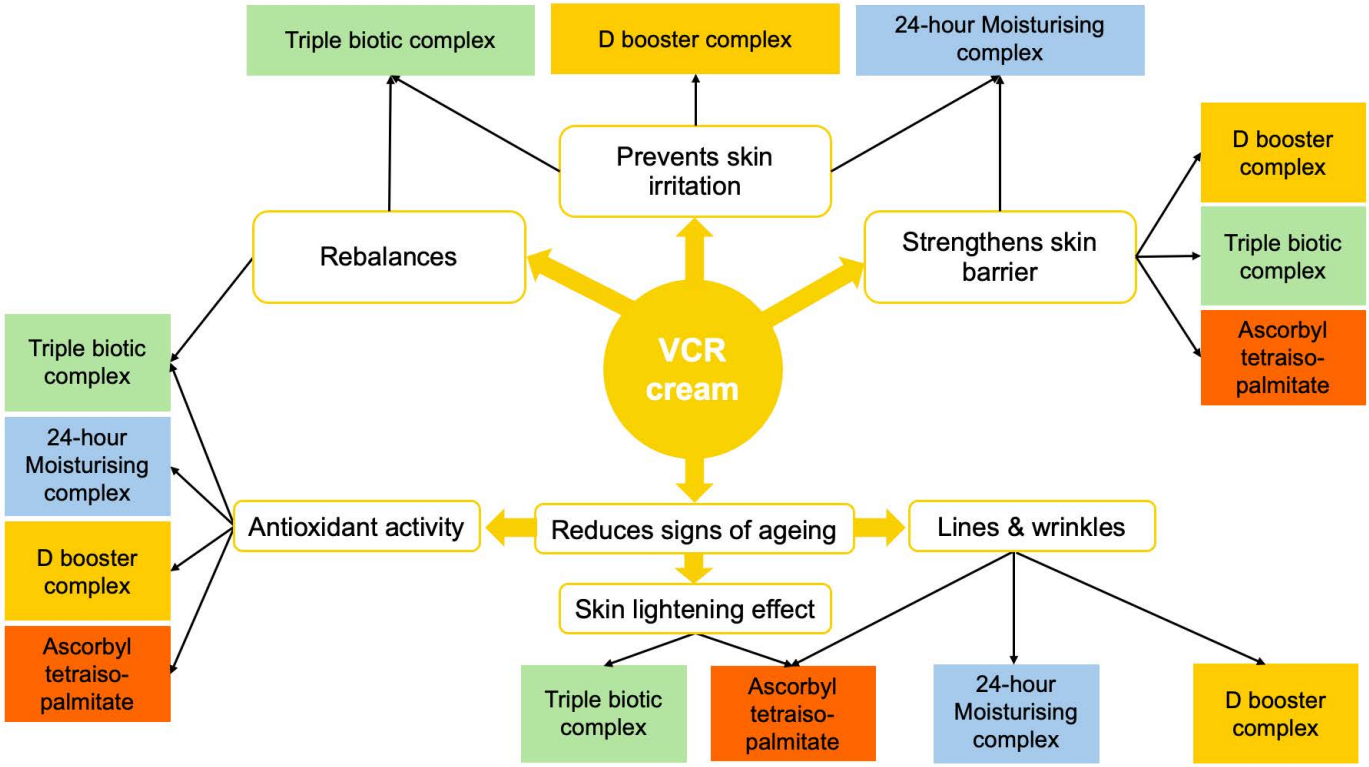
#VCR cream

Unlock a balanced complexion with VCR 24h cream – a cutting-edge daily moisturiser that works in harmony with your skin. Powered by Vitamin C and a D Booster Complex, this advanced formula uses a unique receptor mechanism to enhance your skin's natural radiance for healthier and more vibrant skin.

VCR: The VITAL C REBALANCE cream. Enriched with D booster complex, Triple biotic complex, and Ascorbyl tetraisopalmitate for a naturally healthy-looking radiance and a smoother skin texture.

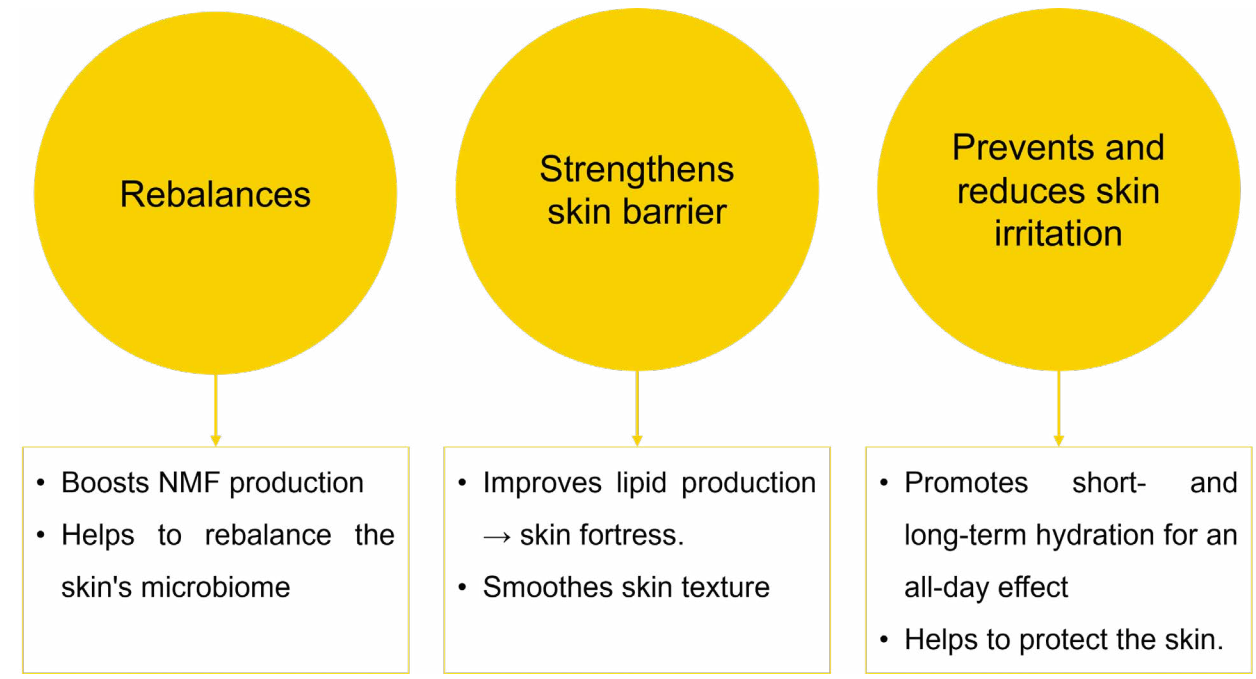
CREAM: Rich texture. Formulated to protect the skin against dryness to deliver the ultimate skincare experience for a vibrant, healthy complexion.

Healthy skin balance



#VCR cream

Main skin benefits:

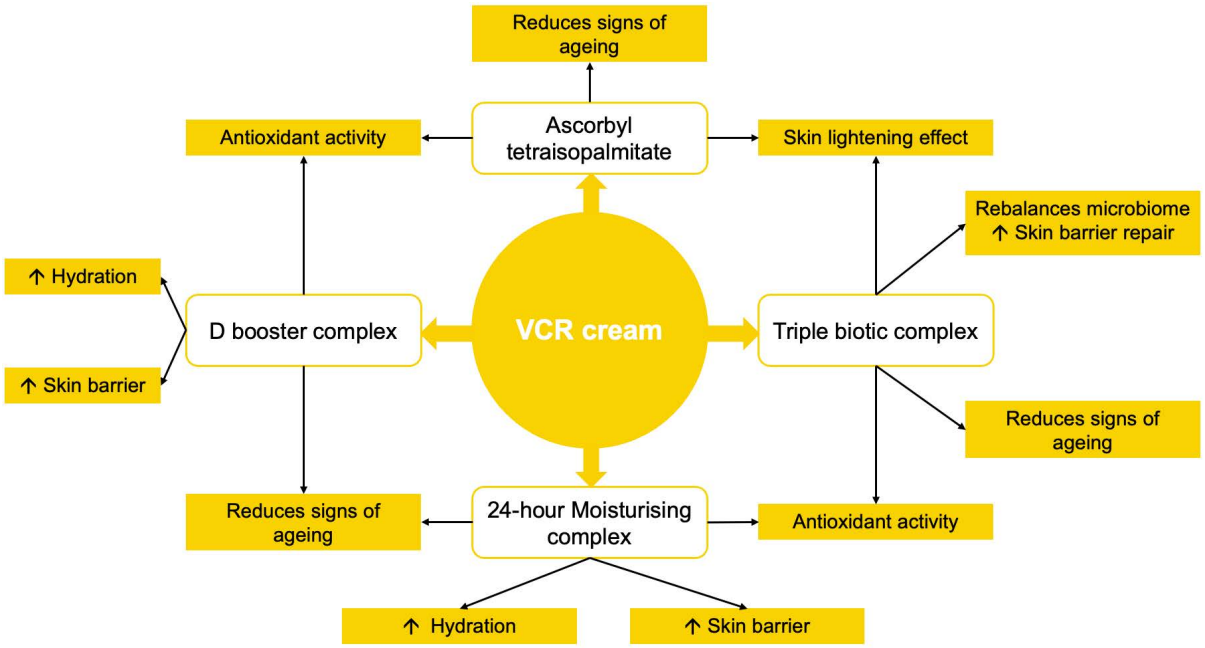


Extended skin benefits

- Rebalances the skin by boosting the natural moisturising factor and the skin's microbiome
- Reinforces the skin barrier, enhancing defence mechanisms and improving lipid production building a skin fortress
- Prevents and reduces skin irritation and hydrates the skin by boosting NMF production to promote short- and long-term hydration for an all-day effect
- Helps to reduce ageing signs of the skin by promoting collagen synthesis and providing a skin brightening effect that contributes to skin radiance. Smoothes skin texture
- Antioxidant action
- Soothing properties

#VCR cream

Mechanism of action



	Ascorbyl tetraisopalmitate	D booster complex	Triple biotic complex	24-hour Moisturising complex
Rebalances			Boosts NMF production Rebalances skin's microbiome ↑ Microflora diversity	
Prevents and reduces skin irritation		↑ Filaggrin production ↑ NMF ↑ Skin moisture	↑ Skin hydration ↓ TEWL	↑ Short- & long-term hydration ↓ TEWL ↓ Flakiness & dryness
Strengthens skin barrier	↑ Barrier function by enhancing skin hydration	↑ Barrier function	↑ Skin barrier stabilisation & repair	↑ Barrier function
Lines, wrinkles & elasticity	↑ Cell proliferation ↑ Collagen synthesis ↓ Activity of collagen degrading enzymes ↓ Age spots	↓ Fine lines and wrinkles ↑ Cell differentiation ↑ Cell activity ↓ Skin repair processes	Firming effect ↑ Collagen production	↑ Elasticity Firms & tones the skin ↓ Fine lines & wrinkles
Antioxidant activity	Protects DNA against UV-induced damage ↓ UVA-induced DNA fragmentation ↓ Lipid peroxidation	Powerful antioxidant properties	Helps to protect the skin	Protects against oxidative stress
Skin lightening effect	↓ Tyrosinase activity ↓ Melanin synthesis ↓ Melanocyte dendricity ↓ UV-induced HP		↑ Skin smoothness, radiance, & complexion Gently exfoliates	

#VCR cream

Available from May 2025

INCI:
Aqua, Caprylic/Capric Triglyceride, Isopropyl Myristate, Glycerin, Glyceryl Stearate SE, Coco-Caprylate/Caprate, Cetearyl Alcohol, Fructooligosaccharides, Beta Vulgaris Root Extract, Cetyl Alcohol, Helianthus Annuus Seed Oil, Persea Gratissima Oil, Sesamum Indicum Seed Oil, Ascorbyl Tetraisopalmitate, Butyrospermum Parkii Butter, Sodium Levulinate, Betaine, Caprylyl Glycol, Propylene Glycol, Potassium Lactate, Hydrogenated Olive Oil Unsaponifiables, Sodium Cetearyl Sulfate, Potassium Sorbate, Lactobacillus Ferment, Lactic Acid, Tocopheryl Acetate, Sodium Acrylate/Sodium Acryloyldimethyl Taurate Copolymer, Sodium Phytate, C15-19 Alkane, Avena Sativa Kernel Extract, Lauryl Glucoside, Sodium Benzoate, Disodium Phosphate, Potassium Phosphate.

Innovation: VCR cream

KEY INGREDIENTS
– D booster complex – Triple biotic complex – Ascorbyl tetraisopalmitate – 24-Hour Moisturising complex
INDICATIONS
– Recommended for all skin types – Dry, flaky skin – Dull skin – Skin conditions that lack filaggrin (dryness & flakiness) – Impaired barrier function – Suitable for Ageing, **Hyperpigmentation, Skin redness** (acute & chronic), **Dryness** & **flakiness**
DIRECTIONS FOR USE
Apply every morning and evening to a clean, dry skin.

#Comparison

VITA C cream	VCR cream
	
20ml / 50ml	20ml / 50ml
4% Magnesium ascorbyl phosphate *Vitis vinifera* seed oil 24-hour Moisturising complex – Natural moisturising sugars: trehalose, fructose, and maltose – Hyaluronic acid – NMF humectants: Sodium lactate, Urea, Allantoin, Sodium PCA, Glycerin, Pentylene Glycol	5% D booster complex 2% Triple biotic complex 1% Ascorbyl tetraisopalmitate 24-hour Moisturising complex – Shea butter – Avocado oil – Sesame oil – Sunflower seed oil
• All ages • Skin with visible signs of photo-ageing • Hyperpigmentation • Dehydrated skin	• All ages • Dry, flaky skin • Dull skin • Impaired skin barrier • Dehydrated skin
Lightweight cream	Rich cream

#VITA creams comparison

Product name	VITA A cream	VITA B^3 cream	VITA C cream	VCR cream
Main active ingredients	1.5% Retinol complex 24-Hour Moisturising complex	5% Niacinamide 24-Hour Moisturising complex	4% Magnesium Ascorbyl Phosphate 24-Hour Moisturising complex	5% D booster complex 2% Triple biotic complex 1% Ascorbyl Tetraisopalmitate 24-Hour Moisturising complex
Skin disorders	AGE MELA CR AC	AGE MELA CR AC	AGE MELA CR AC	AGE MELA CR
Skin signs and results	Rejuvenation Exfoliation Skin texture improvement Reduces blemishes in acne-prone skin Age-defying activity Decreases hyperpigmentation	Soothing and brightening effects Redness reduction Oil regulation Even skin tone Decreases pigmentation	Promotes radiance & glow Skin brightening Antioxidant protection Collagen synthesis Age-defying activity Evens skin tone	Rebalances Strengthens skin barrier Prevents skin irritation Vibrant, rejuvenated complexion
Mechanism of action	Advanced DNA repair	Advanced soothing action	Advanced antioxidant protection and glow	Advanced skin hydration and age-reducing action
Use	Use only at night, 2 – 3 times per week Introduce gradually	AM and PM	AM and PM	AM and PM

#D booster complex

What is D booster complex?
The D booster complex is a powerful synergistic blend of fructooligosaccharides, *beta vulgaris* (beet) root extract and water. D booster complex is vegan friendly, COSMOS, HALAAL, and NATRUE standard certified.

Fructooligosaccharides are prebiotic plant sugars, that not only hydrates the skin, but as a prebiotic, is the actual food source of probiotics (living microorganisms, also known as good bacteria, that are essential for the skin's microbiome). [1]

Beet root has strong antioxidant activity due to the presence of betacyanins (red-violet pigments) and protects against age related diseases and skin cancer. Phenolic and betalains present in beetroot improve the oxidant status and give protection against oxidative damage of lipids. [2]

Fructooligosaccharides powder. [3]

How does D booster complex work in the skin?
The complex activates the expression of the vitamin D receptor (VDR) and promotes VDR's activation. The VDR is the receptor to which vitamin D binds to elicit its effects. An increase in the expression of the VDR leads to an improvement of epidermal differentiation, which may include an increase in filaggrin production and, therefore, more moisturised skin.

In vivo tests shows how the complex has a significant impact in skin moisturisation tested by different methodologies and proving:

- Short- and long-term effects on moisture accumulation test.
- Long term reduction of visible dryness clearly visible by squametry.
- Clearly visible immediate effects. Homogenous over a larger area shown by moisture map.
- Immediate and day long effects on normal skin. Particularly fast on dry skin measured by capacitance.
- The skin smoothness increases and correlates with moisturisation level.
- Subjective evaluation reports that the skin feels moisturised, smoother, and looks better after one application for 24 hours.

Beetroot (*Beta vulgaris*). [4]

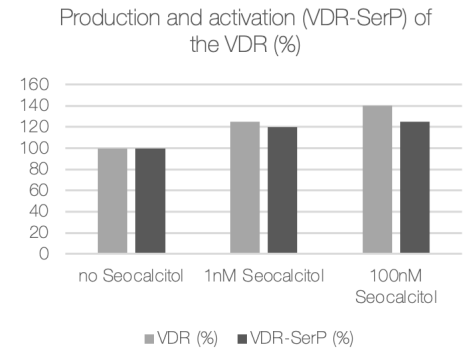
#D booster complex

Efficacy studies – *in vitro* assay

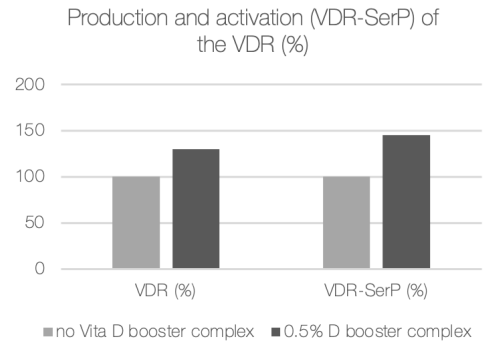
Influence on VDR expression and activation

As a first step in the ***in vitro*** studies seocalcitol, a synthetic analogue of Vitamin D, was assessed for its ability to increase the expression of the VDR and the activation of the VDR. Here the focus was on the analysis of VDR-SerP. Normal human epidermal keratinocytes were incubated for 72 hours in and without the presence of seocalcitol. As could be shown in this experiment (graph 1), seocalcitol was able to clearly increase the production of the VDR and its activation. A dependence of concentration of seocalcitol could also be observed.

In a following study the effect of 0.5% D booster complex on the expression of the VDR and its activation was determined. Normal human epidermal keratinocytes were utilised and were incubated with and without D booster complex for 72 hours (graph 2).



Influence of seocalcitol on the expression of the VDR and its activation (VDR-SerP) by normal human epidermal keratinocytes after 72 hours of incubation.



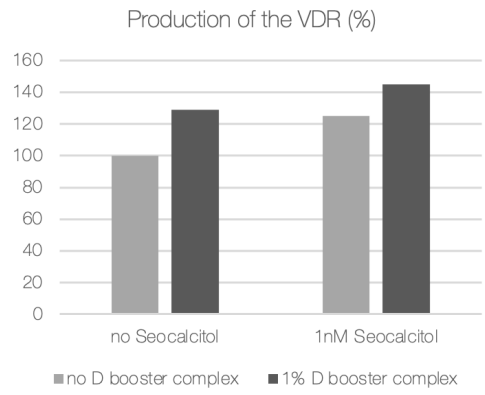
Influence of D booster complex on the expression and activation (VDR-SerP) by normal human epidermal keratinocytes after 72 hours of incubation.

Technical information from supplier, data on file 2025.

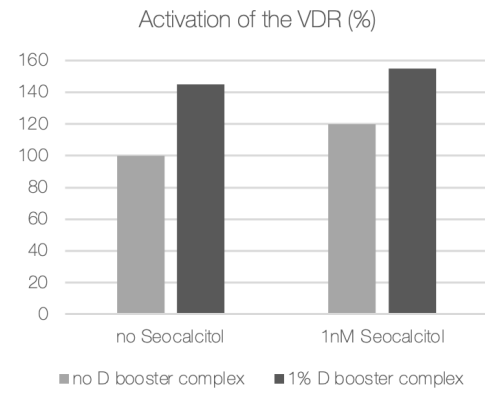
The treatment with D booster complex led to somewhat more pronounced results as compared to the treatment with seocalcitol (synthetic analogue of vitamin D), illustrating the potency of D booster complex to activate VDR signalling, which should lead to the improvement of epidermal differentiation and, hence, the hydration state of the top layer of the skin, the Stratum Corneum.

#D booster complex

In another experiment it was assessed whether D booster complex was able to potentiate vitamin D-induced effects on expression of the VDR and its activation. Normal human epidermal keratinocytes were incubated for 72 hours with and without the presence of seocalcitol (a vitamin D analogue at 1nM) and D booster complex at 1% Results obtained on VDR expression are presented in graph 3, and corresponding results relevant to the activation of the VDR (VDR-SerP) are presented in graph 4.



Influence on expression of the VDR after 72 hours of incubation of normal human epidermal keratinocytes with and without the presence of seocalcitol and D booster complex.



Influence on the activation of the VDR (VDR-SerP) after 72 hours of incubation of normal human epidermal keratinocytes with and without the presence of seocalcitol and D booster complex.

Technical information from supplier, data on file 2025.

As described in the first ***in vitro*** experiment, here too seocalcitol was able to increase and activate the VDR. The addition of D booster complex clearly showed its potentiating effects. This leads to the conclusion that D booster complex can amplify the effects of vitamin D.

#D booster complex

Influence on parameters relevant to epidermal differentiation

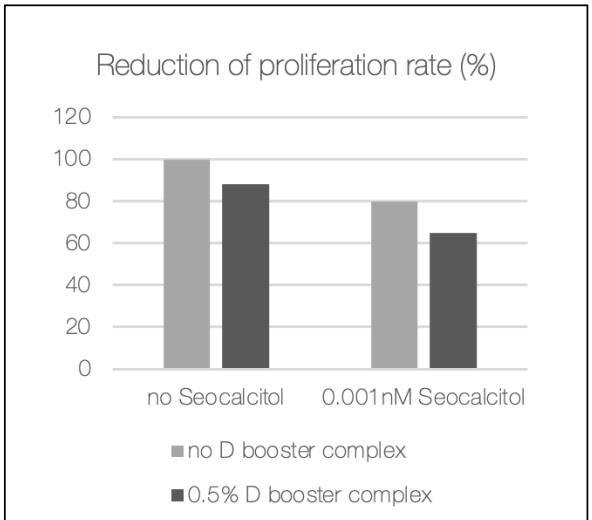
In the above experiment it was clearly shown that D booster complex is able to increase the expression of the VDR and its activation as well. This should lead to the improvement of epidermal differentiation and, ultimately, better barrier function and more moisturised skin.

In order to prove this, a monolayer of normal human epidermal keratinocytes was analysed for relevant signs of epidermal differentiation. In obtaining a two-dimensional monolayer, keratinocytes proliferate until they reach confluence. In this situation the monolayer is fully developed, and keratinocytes then can initiate the differentiation process, the process of building the epidermis.

After reaching confluence, two important parameters were analysed. First, the proliferation rate was determined through BrdU analysis. BrdU is a thymine analogue which, when provided to proliferating keratinocytes, is incorporated into the DNA structure of daughter cells. The more BrdU is incorporated in cells, the more proliferation has taken place. Inversely, as with reaching confluence the proliferation rate should go down, a reduction of BrdU indicates that the cells have reached confluence and should therefore start to enter the differentiation process. This is something which should be expected from the presence of vitamin D and its corresponding receptor (VDR, VDR-SerP).

Normal human epidermal keratinocytes were incubated with and without the presence of 0.001nM seocalcitol and 0.5% D booster complex for 72 hours. Then the proliferation rate of the cells was determined.

The results of these experiments are unambiguous: the incubation with seocalcitol alone led to a clear reduction of proliferation, i.e., the initiation of the epidermal differentiation process. D booster complex also showed that it was able to have similar effects. As with the previously described experiments, D booster complex was able to potentiate the influence of seocalcitol, i.e., vitamin D, on this important parameter.



Influence on proliferation rate of normal human keratinocytes by seocalcitol and D booster complex after 72 hours.

Technical information from supplier, data on file 2025.

#D booster complex

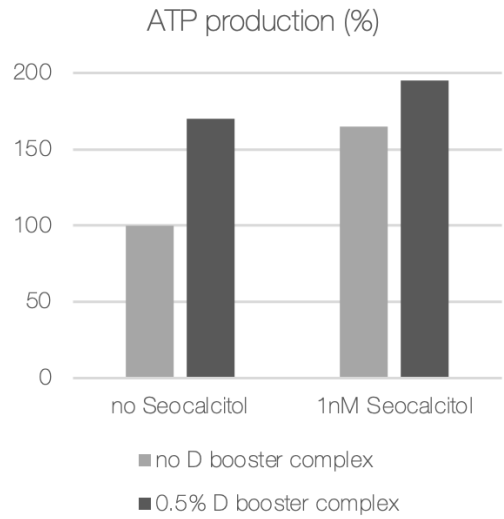
The initiation of the epidermal differentiation process is extremely energy-intensive. One of the major relevancies of vitamin D is that it initiates cellular processes within the keratinocytes, enabling them to produce more energy, which can be measured through the expression of ATP.

In this experiment the influence of 1nM seocalcitol and 0.5% D booster complex on ATP production by normal human epidermal keratinocytes was determined. The cells were incubated with and without the presence of seocalcitol and D booster complex for 72 hours, after which ATP was determined.

Seocalcitol increased the production of ATP by normal human epidermal keratinocytes. Interestingly, D booster complex alone had similar effects. The effects of seocalcitol and D booster complex were approximately 20% higher than those of D booster complex or seocalcitol alone. These results also underline the potency of D booster complex in initiating epidermal processes which are important in ultimately obtaining well-moisturised skin.

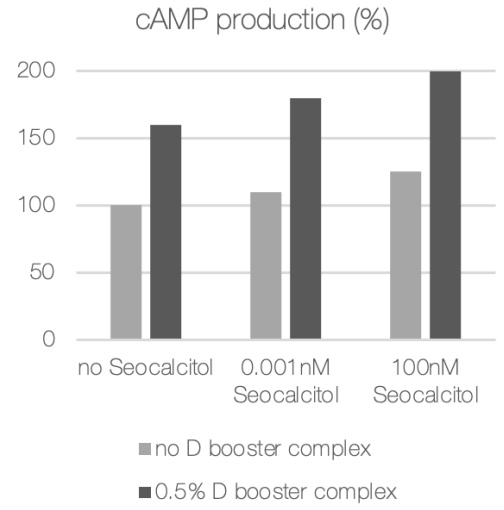
A last important parameter was assessed by analysing the ability to increase the production of cyclic adenosine monophosphate (cAMP). cAMP is an important inducer of terminal differentiation in the epidermis. Whereas the above parameters (VDR, VDR-SerP, BrdU, and ATP) were assessed after 72 hours of incubation with test substances, this parameter was analysed after 96 hours of incubation. In the ***in vitro*** studies, after 72 hours confluence was reached, and differentiation processes were initiated. After an additional 24 hours the keratinocytes became even more engaged in the differentiation process, and this is where cAMP becomes important.

Normal human keratinocytes were incubated with different concentrations of seocalcitol and D booster complex for 96 hours. Subsequently the cells were analysed for the presence of cAMP. D booster complex is able to influence cAMP production.



Influence on ATP production by normal human keratinocytes of seocalcitol and D booster complex after 72 hours.

Technical information from supplier, data on file 2025.



Influence on cAMP production by normal human keratinocytes of seocalcitol and D booster complex after 96 hours.

Technical information from supplier, data on file 2025.

#D booster complex

D booster complex skin benefits

- Improves short- and long-term hydration
  - Helps to improve cell differentiation, promoting an increase in filaggrin production and NMF. Improves skin moisture
  - Activates the expression and promotes VDR's activation
  - Helps to reduce trans epidermal water loss (TEWL)
  - Helps to improve skin repair processes
- Promotes skin barrier function
- Age-reducing signs benefits
  - Contributes to the reduction in the appearance of fine lines and wrinkles
  - Contributes to the enhancement of cell activity
- Powerful antioxidant properties

#Triple biotic complex

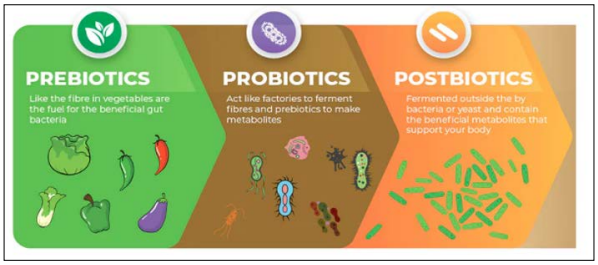
What is Triple biotic complex?

Is a complex made by the fermentation of advanced colloidal oatmeal utilising a specialised *Lactobacillus* strain. Fermentation breaks down the cell wall structure of the oat, leading to the release or synthesis of bioavailable molecules such as various antioxidant compounds and amino acids. These antioxidant compounds can act as free radical terminators, metal chelators, single oxygen quenchers, or hydrogen donors to radicals.

The oats plant. [5]

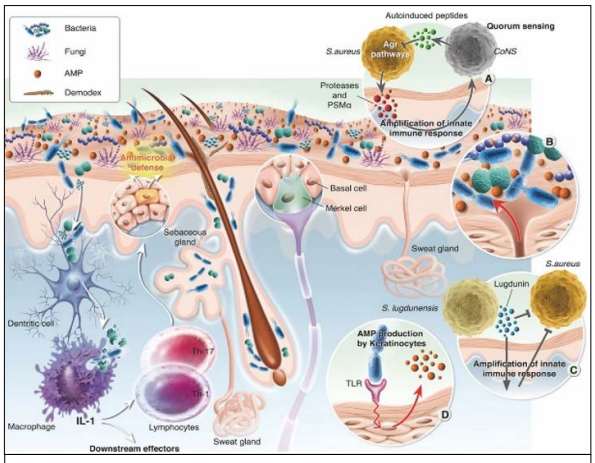
Lactobacillus bacteria. [6]

Triple biotic complex contains beta glucan, starches, antioxidants, ectoin (**prebiotics**); *Lactobacillus*, and diacetyl (**probiotic lysates**); AHAs, amino acids, and bioactive peptides (**postbiotics**).



- Prebiotics are molecules that promotes the growth of beneficial microorganisms on the skin and provide a healthy and balanced diet for skin microbiota.
- Probiotics are live microorganisms which when administered in adequate amounts confer a health benefit by strengthening the skin microbiome.
- Postbiotics are a range of metabolites produced by live bacteria during the fermentation process that help to regulate the composition of the skin microbiome ecosystem.

The skin microbiome is the term for the numerous microorganisms living on the skin. The skin microbiome contains bacteria, archaea, viruses, fungi, and demodex (mites). The skin microbiome contributes to the barrier function of the skin and ensures skin homeostasis. The secretion of protease enzymes by skin microbes is involved in the desquamation process and stratum corneum renewal. Sebum and free fatty acid production are involved in pH regulation. The skin microbiota plays an important role in protecting against potential pathogenic microorganisms by competition and antimicrobial peptide (AMP) production by commensal bacteria or *Malassezia* fungi, which produce a range of indoles that inhibit many other yeasts and moulds. [7]



Skin microbiota, its roles, and its relationship with the immune system. [7]

#Triple biotic complex

How does Triple biotic complex work in the skin?

Prebiotics

Triple biotic complex contains **beta-glucan**, long-chain carbohydrates naturally present in oats, which can form a thin film on the skin and keep it moisturised. Research shows that oat beta-glucan can have an effect on skin bacteria by nourishing the bacterial strain of the skin and therefore stimulating the growth of bacteria. Prebiotics are high-fibre food for live bacteria; therefore, it can be concluded that oat beta-glucans are prebiotics on the skin. [8]

Colloidal oatmeal contains **starches**, naturally present in oats. They are highly hydrophilic and help to hold water, which enhances the moisturising abilities of Triple biotic complex. Improvement in starch digestibility during fermentation is due to the breakdown of starch oligosaccharides. The enzymes bring about cleavage of amylase and amylopectin to maltose and glucose. [9]

Most phenolic compounds in oats are insoluble-bound phenolics that are covalently bonded to the structural components of the cell wall. The crude enzymes from fermented oats had the ability to hydrolyse the bond between phenolics and cell wall macromolecules, leading to the increase of the soluble phenolic content.[8] The fermentation of colloidal oats increased the **antioxidant** capacity of Triple biotic complex.

Ectoin is a natural substance which is produced by bacteria to protect against extreme conditions. It promotes hydration by maintaining the correct water balance in skin meaning the skin appears smoother and softer preventing dehydration of the epidermis.

#Triple biotic complex

Probiotic lysates

Lactobacillus bacteria can inhibit pathogen attachment to epidermal cells of the skin, by blocking the site of attachment and attracting bacteria of the same or similar species. [10] Data shows that heat-killed bacteria, their fractions, or purified components have probiotic effects with advantages over live probiotics.

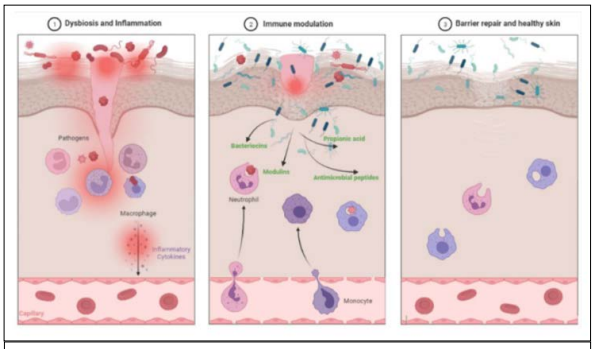
Strains of *Lactobacillus* bacteria (probiotic lysates) can produce **diacetyl**. It has the potential to exhibit dermal antimicrobial activities. [10]

Postbiotics

Strains of *lactobacilli* can produce **α-hydroxy acids** (AHAs) to exhibit pH-adjustments and antibacterial activity. AHAs can exfoliate the uppermost layer of the skin. AHAs can hydrate the skin, improve the stratum corneum barrier function, and enhance the production of ceramides by keratinocytes. Triple biotic complex contains hydroxy acids, particularly Lactic acid.

Amino acids, which are important to the cellular activity of the living epidermis, are essential for maintaining the integrity of the skin barrier, protein synthesis, and nutrient absorption. During fermentation, proteins are digested by microbial proteases and peptidases resulting in amino acids. [9] Triple biotic complex will supply the skin with essential amino acids.

The fermentation process also produces **peptides** that help the skin's cellular renewal. Peptides are involved in the modulation of cell proliferation, cell migration, inflammation, and protein synthesis and regulation. Peptides have high bioavailability.



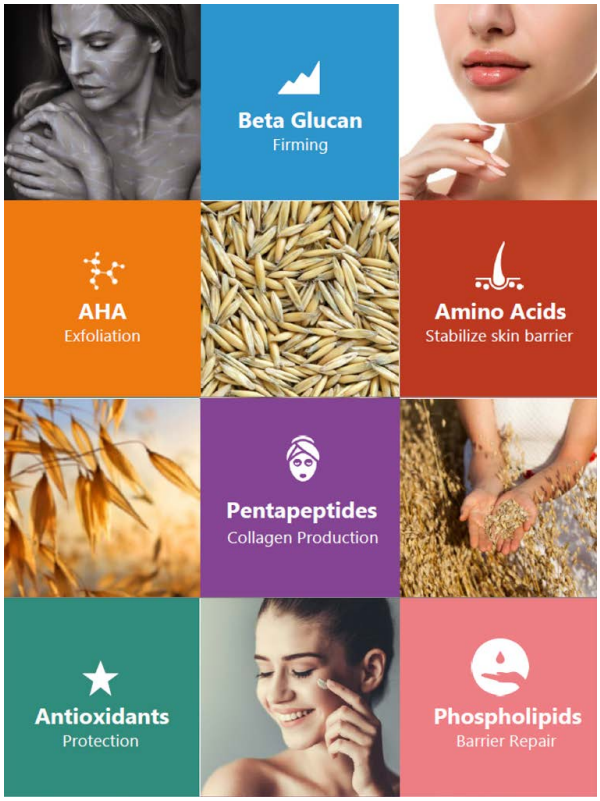
The mechanism of improving skin health by probiotics via blocking the inflammatory pathways. [11]

(1) Depicts dysbiosis and infection due to pathogenic bacteria (red) causing inflammation.
(2) Probiotic bacteria (blue-green) occupy a similar ecological niche to that of pathogenic microbes and avoiding their colonisation.
(3) Recovery of the skin barrier function leading to healthy skin with healthy commensal bacteria.

#Triple biotic complex

Triple biotic complex skin benefits

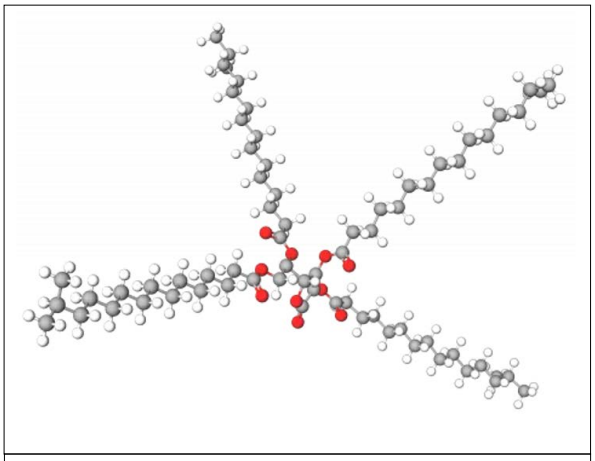
- Skin barrier stabilisation and repair (amino acids)
  - Helps to rebalance the microbiome
  - Boosts the diversity of the microflora selectively, favouring species such as *S.epidermidis* for a healthier skin
- Improves skin hydration and stratum corneum barrier function (AHAs)
- Age-reducing signs and skin lightening benefits:
  - Improves skin smoothness, radiance, and complexion
  - Gently exfoliates the skin enhancing skin brightness (AHAs)
  - Collagen production (peptides)
  - With its content of beta-glucan, helps to firm the skin
- Helps to protect the skin (antioxidants)



#Ascorbyl tetraisopalmitate

What is Ascorbyl tetraisopalmitate?

Ascorbyl tetraisopalmitate is an oil-soluble vitamin C derivative. Ascorbic acid is connected with four 14-methylpentadecanoic acids (tetra-ester), making the water-soluble molecule lipophilic, as such, it can easily penetrate through the skin's lipid barrier, enhancing delivery and effectiveness. Like other forms of vitamin C, Ascorbyl tetraisopalmitate helps prevent cellular ageing signs by inhibiting the cross-linking of collagen, oxidation of proteins, and lipid peroxidation. Working synergistically with other antioxidants like vitamin E, it exhibits advanced skin absorption levels and stability in formulations. Many studies have confirmed the skin-lightening, photo-protective, and hydrating effects of Ascorbyl tetraisopalmitate on the skin. [12]

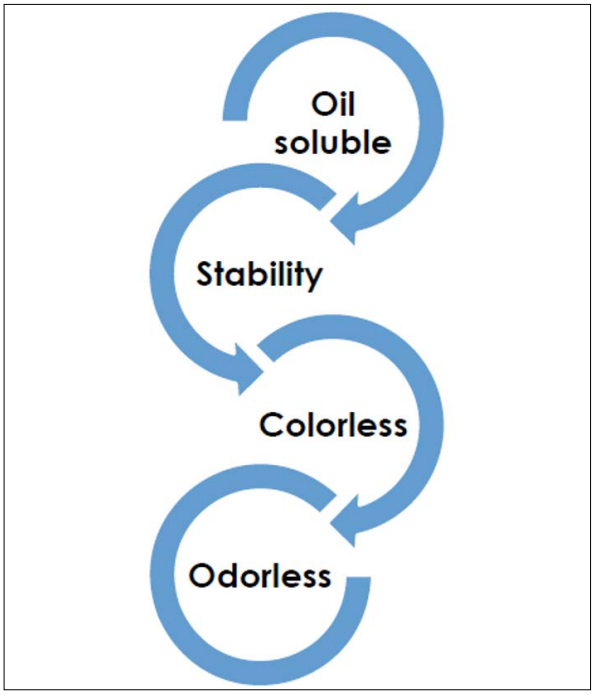


Chemical structure of Ascorbyl tetraisopalmitate. [12]

How does Ascorbyl tetraisopalmitate work in the skin?

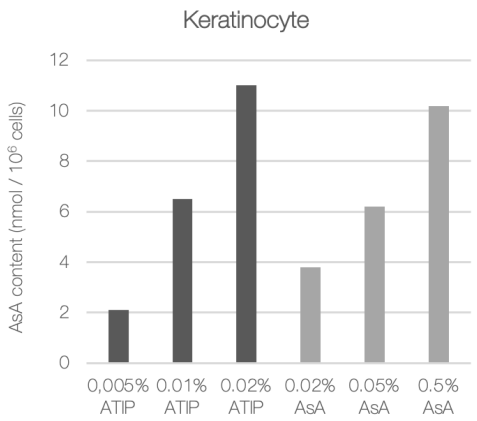
Ascorbyl tetraisopalmitate offers the following benefits:

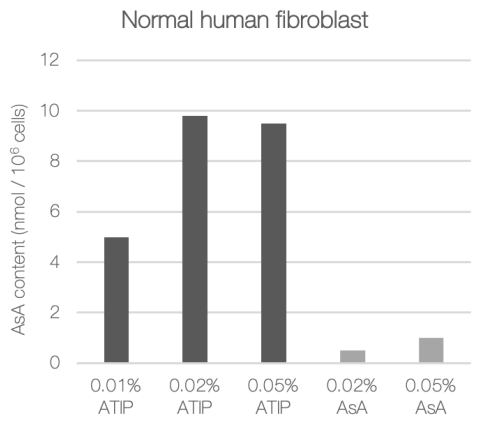
- Efficient percutaneous absorption
- Helps to inhibit the activity of intracellular tyrosinase and melanogenesis (skin lightening)
- Contributes to reducing UV-induced cell / DNA damage (UV protection / anti-stress)
- Assists in preventing lipid peroxidation and promotes the reduction in the signs of ageing (antioxidant)
- Good solubility in skin care oils
- SOD (superoxide dismutase)-like activity (antioxidant)
- Promotes collagen synthesis and collagen protection (age-reducing signs benefits)
- Heat- and oxidation-stable



#Ascorbyl tetraisopalmitate

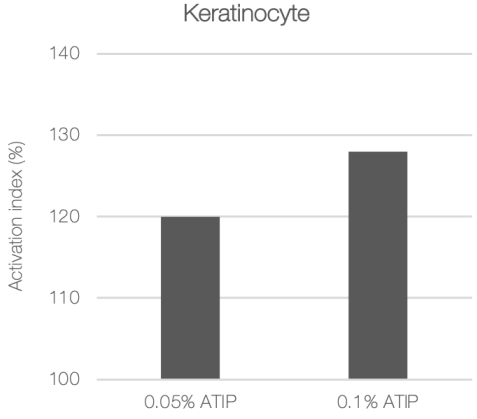
1. Efficient percutaneous absorption

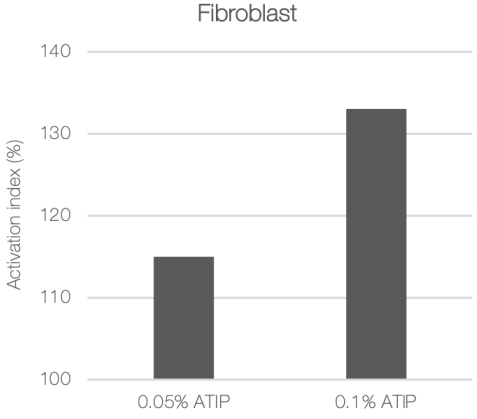




In keratinocytes, when 0.02% Ascorbyl tetraisopalmitate was added, the amount of AsA (L-ascorbic acid) is increased by **3 times** compared to the same concentration of AsA added to the cells.	On fibroblasts, at the same concentrations, the intake of AsA was considerably higher than the addition of AsA itself.
Technical information from supplier, data on file 2025.	

2. Effect on cell activation





Technical information from supplier, data on file 2025.

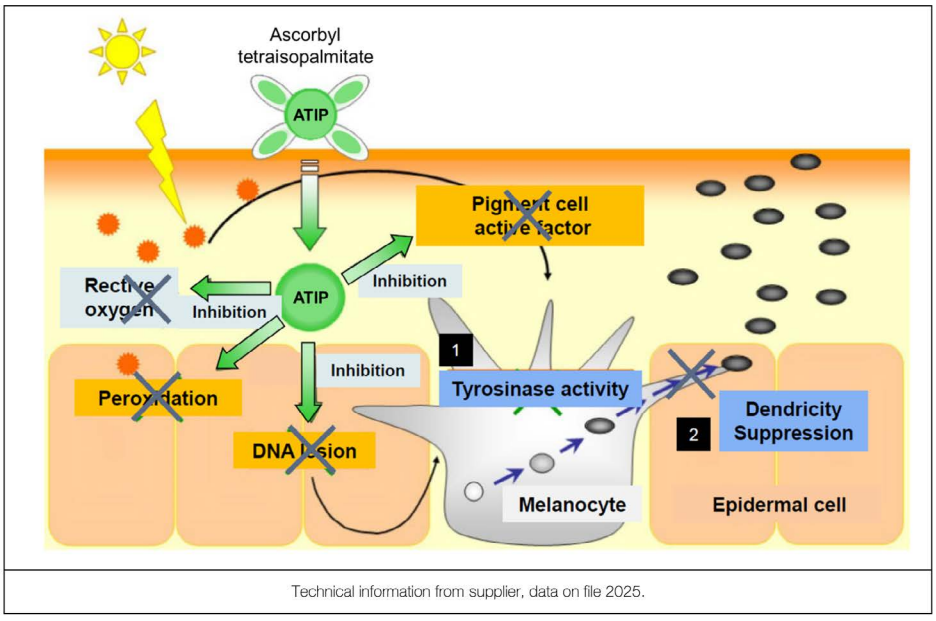
The presence of Ascorbyl tetraisopalmitate in the culture medium dose-dependently increased the proliferation of keratinocytes and fibroblasts.

#Ascorbyl tetraisopalmitate

3. Skin lightening activity of Ascorbyl tetraisopalmitate

The production of melanin is dependent on the amount of the enzyme tyrosinase, which triggers melanogenesis. Ascorbyl tetraisopalmitate (ATIP), once converted into pure vitamin C within the cells, regulates the activity of tyrosinase and subsequently the downstream process of melanin production.

In response to "stress" such as UVB radiation, matured melanocytes have the ability to develop dendrite projections which form highways transporting melanin to epidermal cells (keratinocytes) and into the upper layers of the skin. ATIP effectively suppresses this dendritic formations thereby limiting the opportunities of pigment transfer.

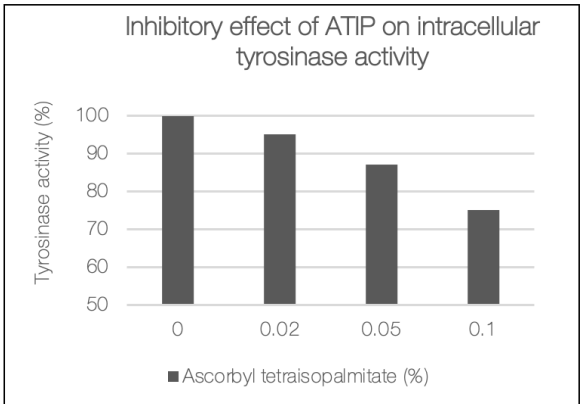


Technical information from supplier, data on file 2025.

3.1 Inhibition of intracellular tyrosinase activity

Ascorbyl tetraisopalmitate (ATIP) was added into mouse melanoma cells (B16-4A5) at various concentrations. After a 72-hour cultivation, the cells were dissolved and extracted. L-Dopa was then added to the extract. After 60 minutes at 37 °C, the amount of dopachrome formed by the activity of tyrosinase was evaluated by measuring its absorbance at 540nm.

Results show that ATIP inhibited the activity of intracellular tyrosinase from concentrations as low as 0.02%. Ascorbyl tetraisopalmitate has proven that 0.1% can reduce the activity of tyrosinase by 25%.



Technical information from supplier, data on file 2025.

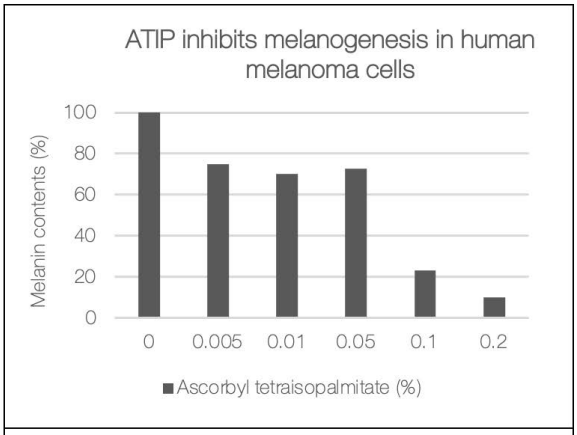
#Ascorbyl tetraisopalmitate

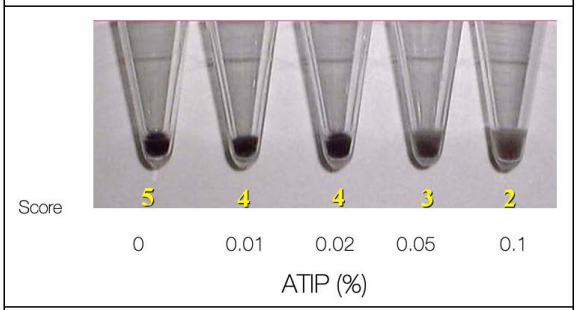
3.2 Melanogenesis inhibition (in human cells)

Various concentrations of Ascorbyl tetraisopalmitate were added to cultured human melanoma cells (HM-3-KO). After 4 days of cultivation, the amount of melanin produced was measured by observation of the colour tone of each cell pellet.

As shown in the graph, ATIP effectively inhibited melanogenesis in human melanoma cells. Results were dose-dependent. The maximum inhibitory effect was recorded at 0.2% with a reduction of 90% in the melanin content.

The maximum effect on melanin synthesis in this test was demonstrated at 0.1%.

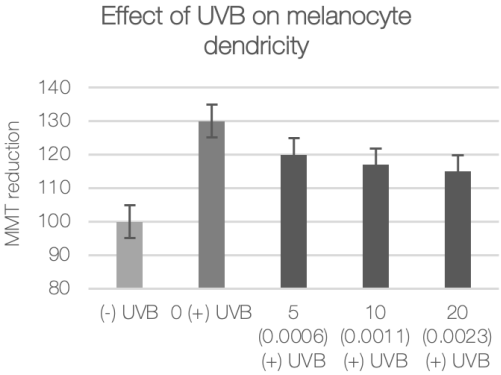




Technical information from supplier, data on file 2025.

3.3 Melanocyte dendricity suppression

Oxidative stress such as UV rays promote dendricity activity of melanocytes. Ascorbyl tetraisopalmitate (ATIP) has a suppressing effect on this melanocyte activity.



*p<0.05

**p<0.01

Technical information from supplier, data on file 2025.

#Ascorbyl tetraisopalmitate

Cell survival rate

Cell survival was evaluated in the skin model after the test. The models treated with Ascorbyl tetraisopalmitate showed a slight increase in cell survival against the control due to the cell activation effect of Ascorbyl tetraisopalmitate (ATIP).

	Index (%)			
(%)	Mean		S.D.	p
Control (Ethylhexyl palmitate) 100%	100.0	±	9.4	1.000
1% ATIP	100.1	±	6.0	0.992
Technical information from supplier, data on file 2025.				

3.4 Clinical *in vivo* study on Ascorbyl Tetraisopalmitate: reduction of UV-induced pigmentation

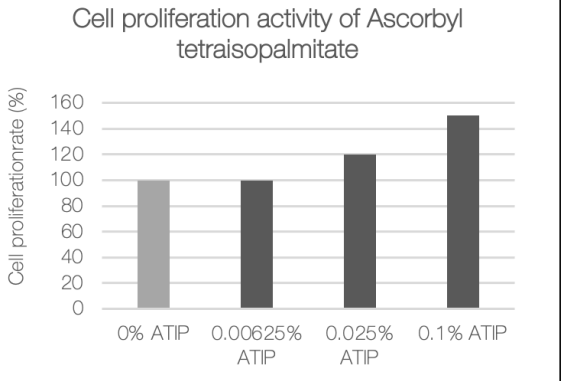
A 3-week ***in vivo*** study demonstrated a skin lightening effect after the skin was irradiated at 1.5 times the MED (minimal erythema dose) of each test subject.

4. Age reducing signs benefits

4.1 Cell revitalising activity / cell proliferation

Ascorbyl tetraisopalmitate was added at various concentrations to human fibroblasts (NB1RGB). After 3 days of cultivation, the cell growth rate was measured by MTT reduction assay.

Ascorbyl tetraisopalmitate dose-dependently proliferated human fibroblasts.

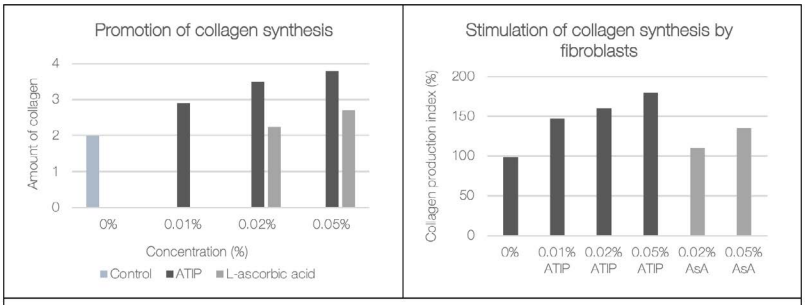


Technical information from supplier, data on file 2025.

#Ascorbyl tetraisopalmitate

4.2 Promotion of collagen synthesis

Proline involved in collagen synthesis was labelled by ^{3}H and added to human dermal fibroblasts (NHDF) with various concentrations of Ascorbyl tetraisopalmitate / L-ascorbic acid and cultivated for 24 hours. Then collagen fractions were obtained. The amount of ^{3}H taken into the collagen fraction was measured by using a liquid scintillation counter and slot blotter.

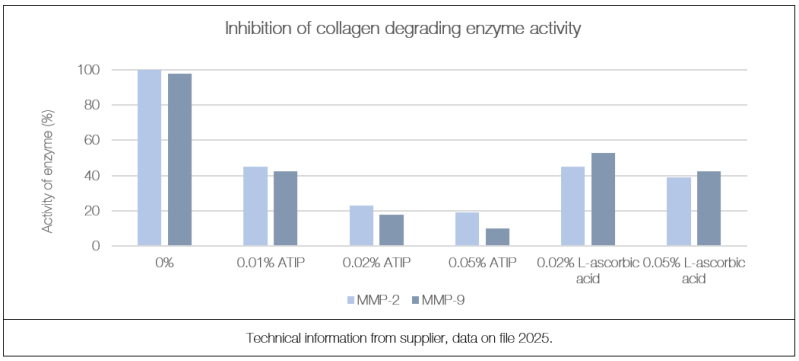


Technical information from supplier, data on file 2025.

Ascorbyl tetraisopalmitate significantly promoted collagen synthesis.

4.3 Inhibition of the activity of collagen degrading enzymes (collagenase)

Ascorbyl tetraisopalmitate was added at concentrations of 0.01-0.05 % to human dermal fibroblasts (NHDF). After a 48-hour cultivation, secreted material was obtained. The activity of two types of collagen degrading enzymes, MMP-2 (72 kDa) and MMP-9 (92 kDa), in the secreted material were evaluated by gelatine zymography.



Technical information from supplier, data on file 2025.

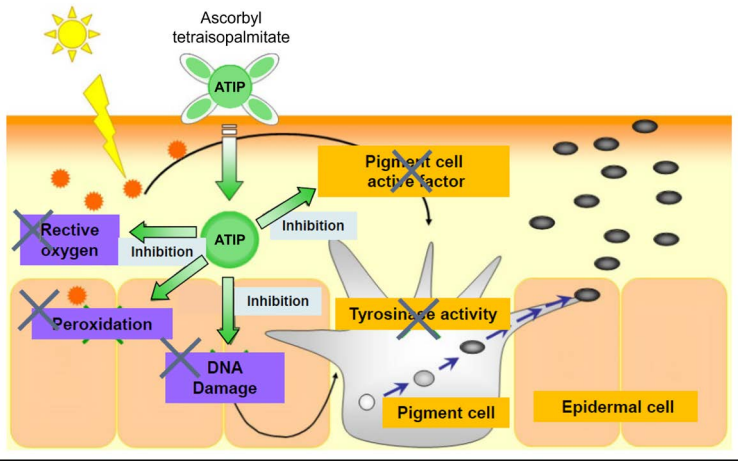
Ascorbyl tetraisopalmitate drastically inhibited the activity of both MMP-2 and MMP-9. The inhibitory effect was considerably higher than that of L-ascorbic acid.

4.4 Age spot reduction

Ascorbyl tetraisopalmitate helps to reduce age spots on the face (after 16 weeks) and hands (1 month) ***in vivo***.

#Ascorbyl tetraisopalmitate

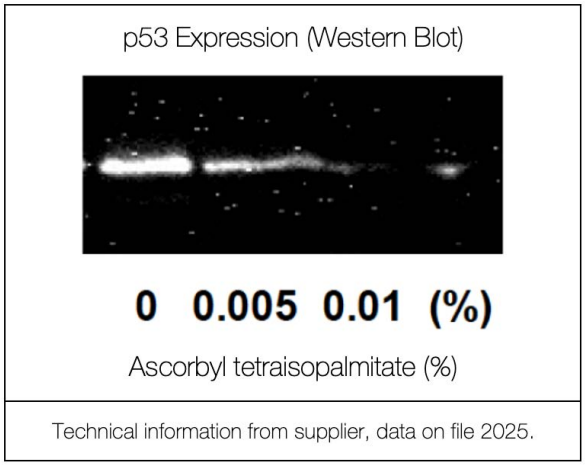
5. Ascorbyl tetraisopalmitate offers DNA protection



Ascorbyl tetraisopalmitate offers protection against ROS, peroxidation, and DNA damage.

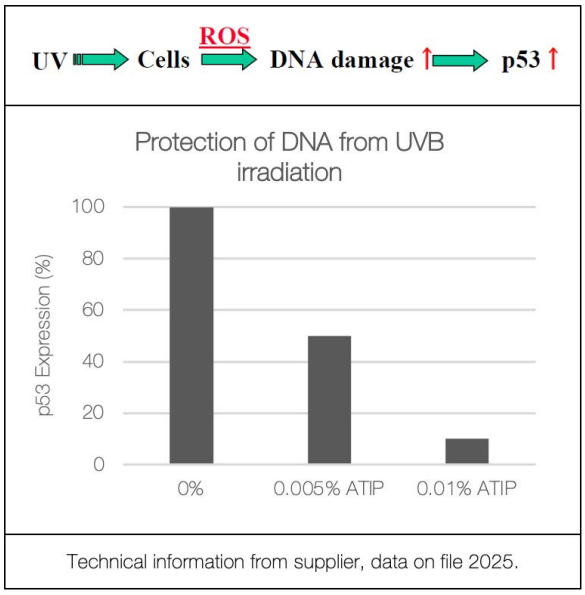
5.1 Protection of DNA from UVB irradiation

When cells are exposed to UVB rays, a cancer suppressor, p53 protein, is activated in response to DNA damage. The amount of expressed p53 was measured as an indicator of the amount of damage to DNA. Human fibroblasts (NB1RGB); UVB (0.1 J/cm^2).



Technical information from supplier, data on file 2025.

Ascorbyl tetraisopalmitate significantly inhibited the expression of p53, and as such helps to protect DNA from damages caused by UVB irradiation.



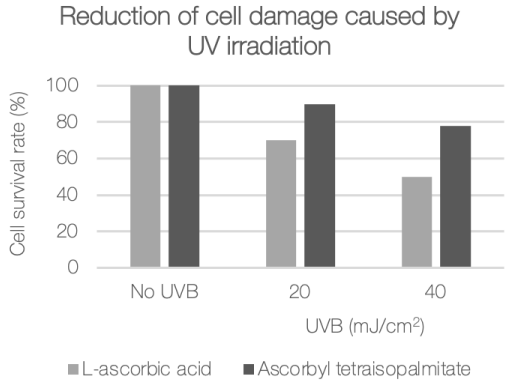
Technical information from supplier, data on file 2025.

#Ascorbyl tetraisopalmitate

5.2 Reduction of cell damage caused by UV irradiation

Ascorbyl tetraisopalmitate and L-ascorbic acid were added at the concentration of 0.01% to epidermal cells. The cells were then irradiated with UVB. After a 24-hour cultivation, cell survival rate was measured by WST-1 assay.

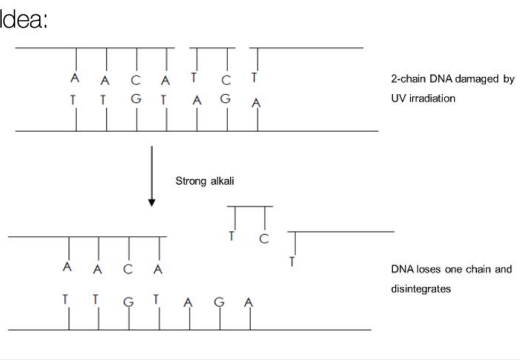
Protective effect of Ascorbyl tetraisopalmitate was higher than that of L-ascorbic acid due to the fact that the conversion rate of Ascorbyl tetraisopalmitate into the cells is higher than that of pure ascorbic acid.



Technical information from supplier, data on file 2025.

5.3 The Comet assay test

The comet assay, also called the 'Single Cell Gel Assay', is the technique to detect DNA damage and repair at the level of single cells. The comet assay or single cell gel electrophoresis assay is based on the alkaline lysis of labile DNA at sites of damage. 'Comet Assay' is one of the most popular tests of DNA damage detection (e.g. single- and double-strand breaks, oxidative-induced base damage, and DNA-DNA / DNA-protein cross linking) by electrophoresis, developed in recent years. Comet assay has very high sensitivity to detect DNA damage.



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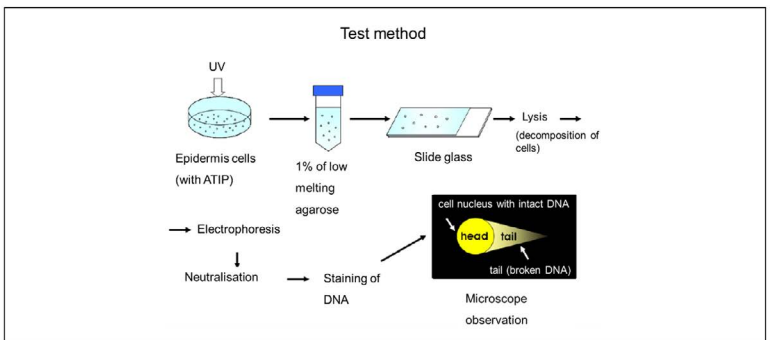
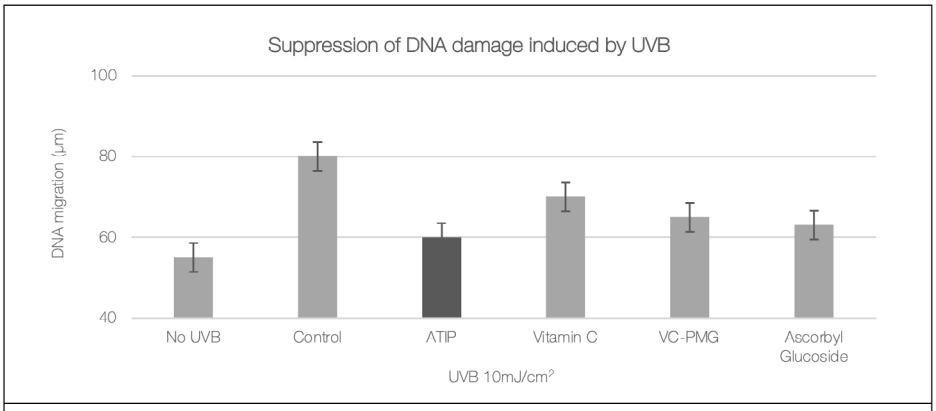


Technical information from supplier, data on file 2025.

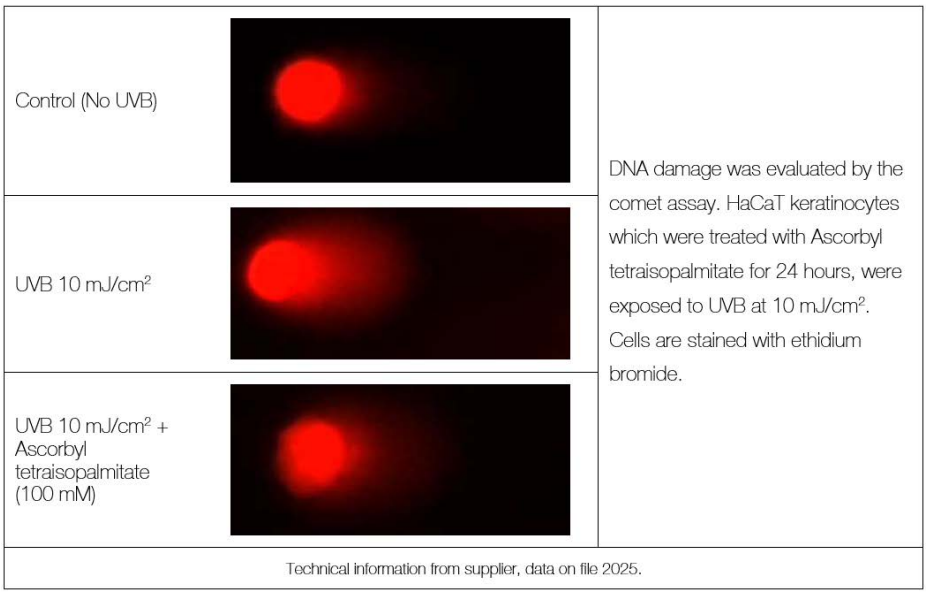
#Ascorbyl tetraisopalmitate

Suppression of DNA damage induced by UVB (Comet Assay test)



Technical information from supplier, data on file 2025.

DNA damage was evaluated by the comet assay. HaCaT keratinocytes which were treated with vitamin C derivatives for 24 hours, were exposed to UVB at 100 mJ/cm^2.



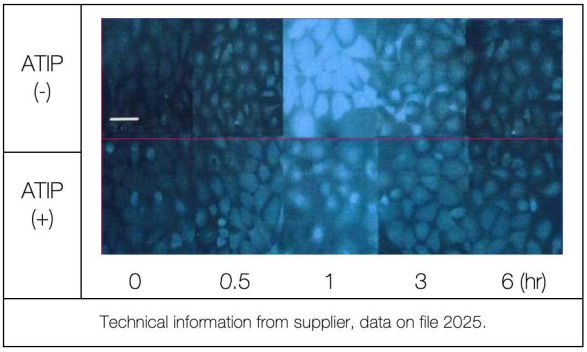
Technical information from supplier, data on file 2025.

The images above show a smaller and less intense 'tail' when cells are treated with Ascorbyl tetraisopalmitate which indicates that ATIP helps to protect DNA from UVB damage.

#Ascorbyl tetraisopalmitate

5.4 Protection against UVA (UVA dose: 100 mJ/cm^2)
Inhibition of keratinocytes' DNA damage induced by UVA
The light parts on the pictures (taken 1 hour after UVA irradiation) indicate 8-hydroxyguanosine, an index of DNA damage.

The effect of UVA irradiation is noticeable 1 hour after and the addition of Ascorbyl tetraisopalmitate (ATIP) to cells culture prove that less 8-OHdG has been released and then that DNA has been protected from UVA damage. The application of Ascorbyl tetraisopalmitate inhibits the release of 8-hydroxyguanosine, thereby protecting the cell against UVA damage.



Technical information from supplier, data on file 2025.

Protection of cell damage induced by UVA
Microscopic pictures of keratinocytes 24 hours after irradiation.

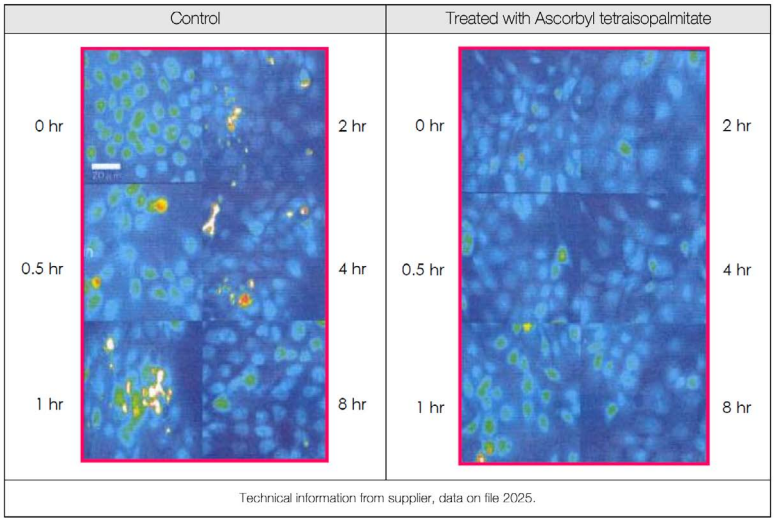
Technical information from supplier, data on file 2025.

Keratinocytes survival is much better when cells have been incubated with Ascorbyl tetraisopalmitate → protective effect against UVA. Ascorbyl tetraisopalmitate treatment reduces cell death by 31.5%.

#Ascorbyl tetraisopalmitate

Inhibition of DNA fragmentation induced by UVA

HaCaT cells were treated with 0.8% Ascorbyl tetraisopalmitate. After UVA irradiation, DNA fragmentation was detected by nick end labelling method (TUNEL). Ascorbyl tetraisopalmitate significantly suppressed DNA fragmentation (shown with fluorescent staining).



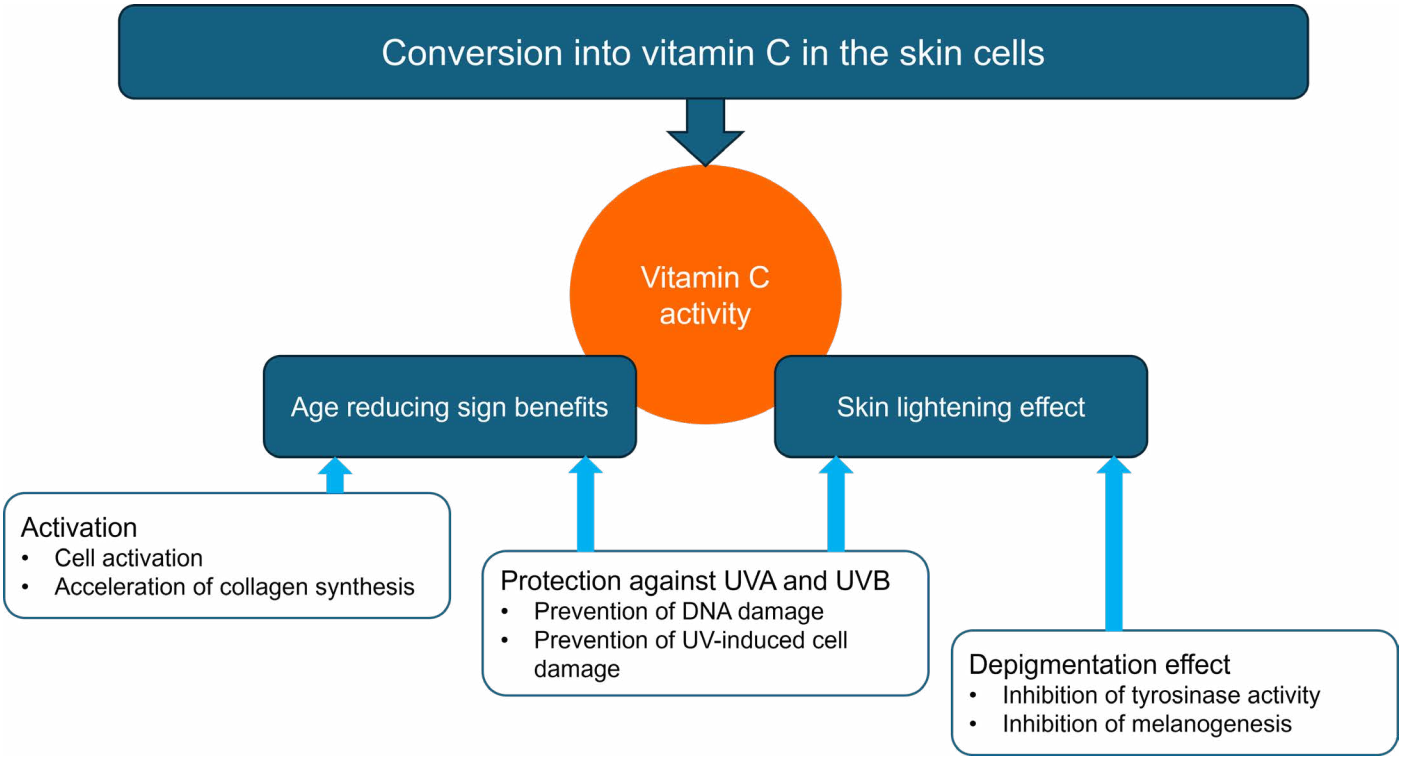
6. Ascorbyl tetraisopalmitate helps to reduce the signs of acne

Ascorbyl tetraisopalmitate helps to reduce acne-signs as well as inhibit the production of squalene peroxide *in vivo*.

#Ascorbyl tetraisopalmitate

Ascorbyl tetraisopalmitate skin benefits

- Promotes skin brightening
  - – Downregulates intracellular tyrosinase activity
  - – Downregulates melanin synthesis
  - – Helps to suppress melanocyte dendricity
  - – Contributes to reducing UV-induced pigmentation
- Age-reducing signs benefits
  - – Enhances cell revitalising activity / cell proliferation
  - – Promotes collagen synthesis
  - – Downregulates the activity of collagen-degrading enzymes
  - – Helps to reduce age spots
- Antioxidant action
  - – Helps to protect DNA against UV-induced damage
  - – Assists in inhibiting UVA-induced DNA fragmentation
  - – Helps to protect against lipid peroxidation
- Enhances skin hydration promoting skin barrier function



#24-hour Moisturising complex

What is 24-Hour Moisturising complex?

The 24-Hour Moisturising complex consists of Shea butter (*Butyrospermum parkii*), Avocado (*Persea gratissima*) oil, Sesame (*Sesamum indicum*) seed oil, and Sunflower (*Helianthus annuus*) seed oil.

Shea nut butter is produced by cold pressing the fruits (nuts) of the shea tree which is grown in central Africa. These trees only start to bear fruit after 15-20 years and 15-20kg fruit only produces 1.5kg of shea butter. It is mainly composed of oleic and stearic fatty acids and also contains linoleic, palmitic and arachidic fatty acids.

Shea butter. [13]

Avocado oil is obtained from the pressure of the fruits of *Persea gratissima* Gaertn., containing vitamins A, D, and E. It is native to South America and also cultivated in Africa, Mexico, United States, and Israel. The major fatty acids of avocado is oleic, followed by palmitic, and linoleic acids. Trace amounts of myristic, stearic, and arachidonic fatty acids are also present. Avocado contains a large mineral portion.

Avocado oil. [14]

Sesame seed oil is obtained by cold pressing its seeds. The main producers are Asia (China, India, Myanmar), Africa (Sudan), and America (Mexico). Sesame seeds contain between 40-55% lipids. The unsaponifiable fraction contains two diarylfuranofuranic lignans: sesamin and sesamolin. During refining, sesamolin easily forms antioxidant phenols, sesamol and, to a lesser extent, sesaminol. Sterols and tocopherols are found in lower concentrations. Sesame seed oil is rich in saturated fatty acids: palmitic and stearic acid, and unsaturated fatty acids: oleic, and linoleic acids. These seeds also contains proteins and carbohydrates, in the form of oligosaccharides, in their composition.

Sesame oil. [15]

Sunflower seed oil is produced by extraction and subsequent refining of *Helianthus annuus* L. seeds. At present sunflower is cultivated in the European Union, United States, and Argentina. South Africa, India, Turkey and China contribute to smaller amounts. Sunflower seeds are rich in unsaturated fatty acids: linoleic, oleic, palmitic, stearic, arachic, linolenic, and behenic fatty acids. It also has a high proportion of sterols and tocopherol (vitamin E). Other active components include phenol acid (chlorogenic, caffeic), carotenoids, lecithin, and minerals.

Sunflower seed oil. [16]

#24-hour Moisturising complex

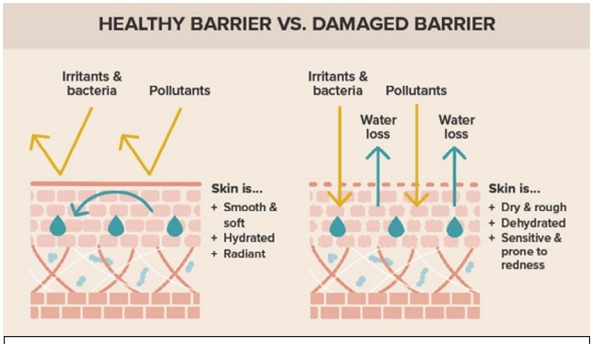
How does 24-Hour Moisturising complex work in the skin?
Shea butter has skin soothing and replenishing properties. It gives emollient benefits that helps to maintain moisture in the skin.

Because of its chemical composition, **avocado oil** nourishes deeply, contributes to a smoother epidermis, and helps to alleviate flakiness and dryness. Avocado oil also has antioxidant activity to help protect the integrity of the skin from oxidative processes. The vitamin E has both antioxidant and moisturising activity, helping to protect and retain water in the skin. Stearic, linoleic, oleic, linolenic, and lauric acids are emollient compounds which give the skin improved moisture, smoothness, and flexibility. These compounds help to repair the skin and influence skin permeability, improving barrier function.

The antioxidant activity of **sesame oil** is mainly due to its content of sesamin and sesamolin. Its tocopherol content also contributes to this action. The unsaponifiable fraction has a very effective regenerating activity to treat the symptoms of ageing in the skin. These principles manage to increase the elasticity of the skin and modify the microstructure of the stratum corneum very quickly. [17] The moisturising action of this oil is due to its linoleic acid content. Different clinical trials have shown that topical application of linoleic acid (as well as its polyunsaturated derivatives) softens the skin and considerably reduces trans epidermal water loss. [18, 19]

#24-hour Moisturising complex

Sunflower seed oil has skin barrier repairing activity as it is rich in essential fatty acids, which have important regulatory actions on skin elasticity and moisture. Stearic, linoleic, oleic, linolenic and lauric acids are emollient compounds which give the skin improved moisture, smoothness, and flexibility. These compounds help repair the skin and influence skin permeability, improving barrier function. Vitamin E also has moisturising activity, helping to retain water in the skin. Repeated topical applications of vitamin E on the skin helps to significantly reduce wrinkles and skin roughness. [20] Sunflower seed oil has antioxidant activity due to vitamin E's actual antioxidant action as well as its free radical scavenger action.

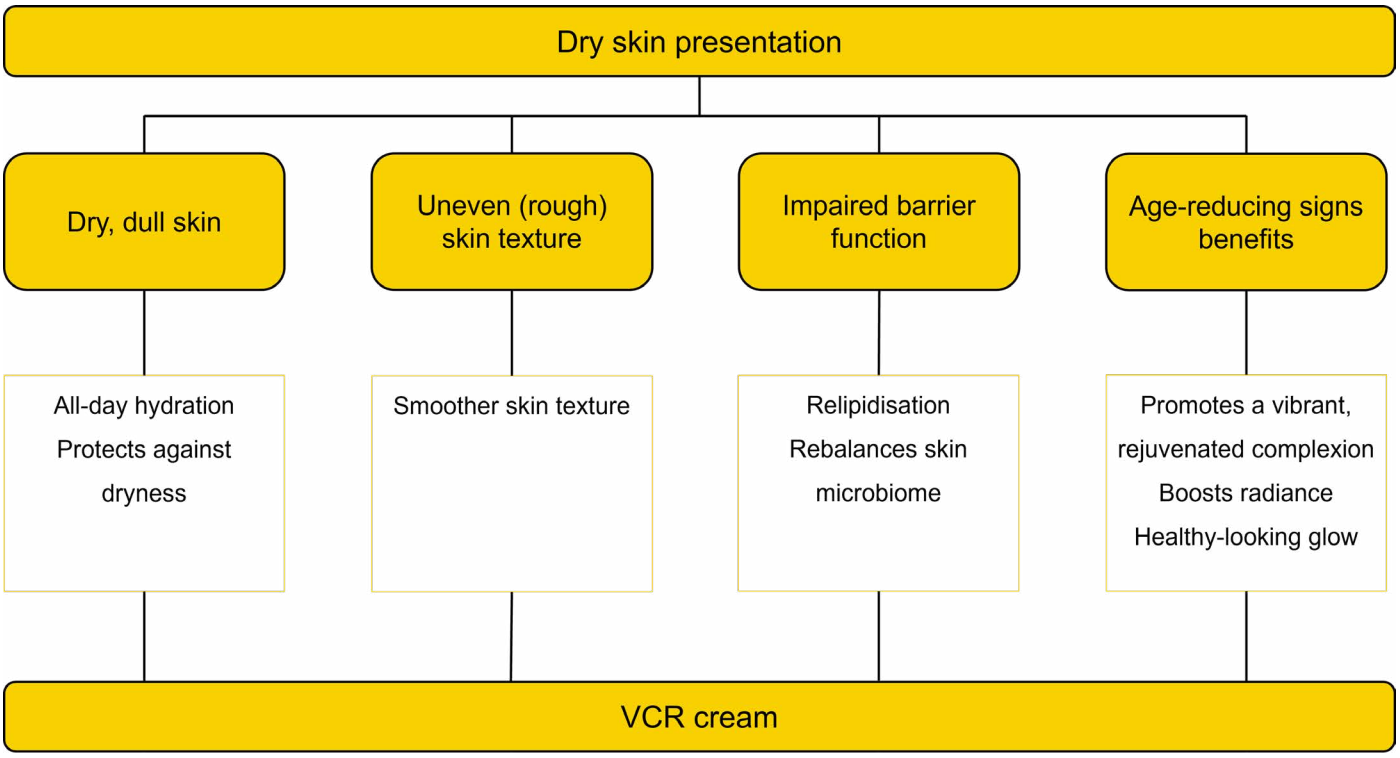


The importance of a healthy skin barrier.

24-Hour Moisture complex skin benefits

- Promotes skin hydration
  - Contributes to short- and long-term hydration
  - Contributes to the reduction of TEWL
  - Improves moisture, smoothness, and flexibility
  - Helps to alleviate flakiness and dryness
- Assists with improving skin barrier function and repair
- Age-reducing signs benefits
  - Helps to increase elasticity; firms and tones the skin
  - Contributes to the improvement of the appearance of fine lines and wrinkles
- Antioxidant action to protect the skin against oxidative stress
- Soothing effect

#VCR cream


Dry skin presentation
Dry, dull skin
Uneven (rough) skin texture
Impaired barrier function
Age-reducing signs benefits
All-day hydration
Protects against dryness
Smoother skin texture
Relipidisation
Rebalances skin microbiome
Promotes a vibrant, rejuvenated complexion
Boosts radiance
Healthy-looking glow
VCR cream

#Dry skin

Introduction

Dry skin is defined as a disturbance of the surface of the skin due to inadequate water or oil content of the skin. The legs, hands, and dorsal forearms are usually the first to be affected by dry skin, which can extend to the trunk and face. Dry skin feels rough and tight to the touch. It appears flaky and may have accentuated skin lines. Some areas may be reddened if inflammation occurs. Dark-toned skin may appear grey or ashen when dry. [21] The number of melanocytes per unit of body surface area decreases, diminishing protection against, for example, sun damage. [22]

Dry skin feels rough, may have accentuated lines and show signs of sun damage.

Dry skin is estimated to affect between 30% to 60% of older adults. Changes in the skin related to normal ageing may increase the likelihood of dry skin. With age, the number of small blood vessels is reduced, resulting in a diminished supply of blood and nutrients to the skin. The number of sweat and sebaceous glands, as well as in lipid production, are reduced in the skin. Thinning of the epidermis and elastic fibres that provide dermal support reduces the strength of the barrier layer that protects the skin from water loss. Age-related reduction in lipids and elasticity decrease the suppleness of the skin and resistance to damage. [21]

The onset of dry skin is thought to be mediated by genetics, environmental factors, ageing, and other factors such as ethnicity. [23] Lifestyle factors associated with dry skin include inadequate food or fluid intake, exposure to sunlight and dry climates, and the use of alkaline cleansers. [21]

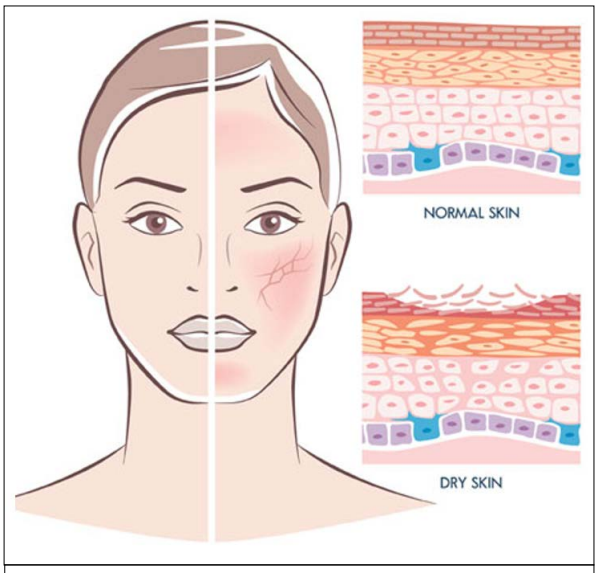
<u>The roles of genetics and environmental factors</u>

From the genetic perspective, dry skin is likely to be the result of a number of mutations across different pathways. Some of these pathways are related to certain dermatological conditions. Some conditions are associated with mutations to the gene coding for the structural protein filaggrin. A deficiency in filaggrin, and its degradation products which are part of the NMF, is associated with dry skin. NMF is a mixture of hygroscopic compounds important for maintaining adequate skin hydration. [23]

#Dry skin

Environmental factors, such as frequent washing / showering or exposure to low air humidity, are also triggers for dry skin. As an example, dry skin is more prevalent in the winter season when the air is at low humidity. The latter creates a water gradient between the skin and the external environment; this increases the driving force to draw water out of the skin and the skin becomes drier. [23]

Chronic exposure to ultraviolet sunlight over the course of one's lifetime produces changes in the histology and DNA of skin cells. This process is called photo-ageing. Skin cells absorb radiation and produce harmful compounds called reactive oxygen species (ROS), which damage cell DNA and cell walls. This photo-ageing process also leads to breakdown of skin collagen by matrix metalloproteinases (MMPs), a group of protein degrading enzymes. These enzymes lead to a decrease in new collagen synthesis as well as large accumulation of a disorganised elastic structure of the dermis. These interactions result in dry, sallow-coloured, leathery, furrowed skin. Environmental conditions affect skin hydration and can increase the severity of a dry skin problem. [21]



Dry skin versus normal skin.

<u>The role of ageing</u>

Ageing makes skin more susceptible to dryness. There are various potential Etiologies of dry skin in older people including reduced epidermal differentiation and lipid synthesis. Additionally, the level of filaggrin is lower in aged skin. As a result, the skin's water holding capacity decreases significantly. [23]

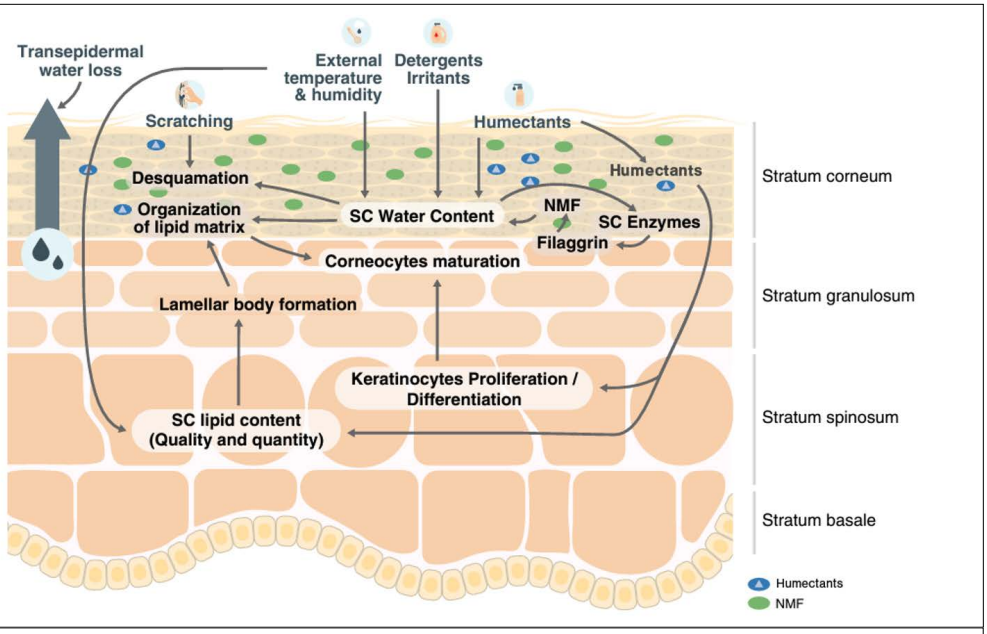
<u>Role of soaps</u>

Soaps with alkaline pH will raise the normally acidic skin pH. This alkalinity chemically breaks down the skin's protective lipids. Alkalinity causes the bonds between lipid components to break into water-soluble components that are easily washed away, increasing the risk of transepidermal water loss and resulting in skin dryness. [21]

#Healthy skin equilibrium

Healthy skin is an equilibrium

The stratum corneum is key in regulating water flux and retention. There are several processes involved in the formation and effective function of the stratum corneum which include NMF formation, lipid processing, keratinocyte differentiation, and desquamation (i.e. loss of corneocytes, shedding occurs within 2 weeks in normal stratum corneum). An adequate equilibrium is necessary between these four, highly interdependent processes to keep the skin healthy. [23]



Schematic diagram showing a subset of key events affecting skin equilibrium.

Environmental factors are also important in influencing this equilibrium. It is assumed that these environmental triggers act in two steps: first short-term effect, then on a more long-term perspective through the perturbation of normal epidermal differentiation (i.e. the stepwise transformation of keratinocytes into corneocytes). The short-term effect can be illustrated by the consequences when the skin is suddenly exposed to cold, dry air: water is quickly lost from the stratum corneum (owing to the altered water gradient). As short-term consequence, there is insufficient water for a proper functioning of enzymes involved in NMF production and epidermal desquamation. [23]

The longer-term effect of exposure to adverse environmental conditions (such as cold air with low humidity) results in major perturbation of normal epidermal differentiation which ultimately ends in a dry skin cycle. Within the dry skin cycle, the skin barrier attempts to repair itself which induces a hyperproliferative state, characterised by dysfunctional keratinocyte differentiation. In turn, this results in further impairment to maturation and desquamation of the stratum corneum, thereby becoming thicker with reduced water-binding properties. The induction of the inflammatory hyperproliferative state is key in the cycle of dry skin as it leads to production of small / immature corneocytes and overproduction of a variety of poor-quality cellular materials and structures vital to the proper functioning of the skin barrier. [23]

Natural moisturising factors (NMFs) and endogenous humectants

NMFs include a variety of compounds. These components support epidermal barrier homeostasis by binding and preserving water in the stratum corneum layer. The levels of filaggrin and corneocyte maturation are inversely related to greater quantities of NMF associated with mature corneocytes. Reduced levels of NMF may be related to filaggrin synthesis and / or reductions in filaggrinolysis. Dry skin is also associated with lower NMF levels. Like stratum corneum lipids, NMF levels also vary seasonally, with ageing and by anatomical region. [24]

D booster complex is an important initiator of filaggrin production, which is the most important 'raw material' for the production of NMF. It is essential for epidermal differentiation. Includes an increase in filaggrin production and, therefore, more moisturised skin.

Corneocyte maturation, corneodesmolysis, and desquamation

The integrity of the stratum corneum depends on coordinated and tightly regulated differentiation, corneocyte maturation, and coordinated corneocyte desquamation. Corneodesmosomes are the major components responsible for the cell-cell adhesion and connectivity between corneocytes, supporting the 'brick-and-mortar' arrangement of the stratum corneum. Corneocyte desquamation is an essential component of stratum corneum homeostasis and is defined by continuous shedding at the surface of the skin. Alterations in desquamation can lead to the persistence of corneodesmosomes in the outer layer of the stratum corneum, which is a clinical characteristic of hyperkeratotic and dry skin. [24]

Triple biotic complex contains hydroxy acids, particularly lactic acid with known keratolytic properties. AHAs can exfoliate the uppermost layer of the skin, improve skin hydration and stratum corneum barrier function as well as enhance the production of ceramides by keratinocytes.

Stratum corneum lipids

The stratum corneum has a complex lipid composition of ceramides, cholesterol, fatty acids, and cholesterol sulphate. Stratum corneum lipids are formed during keratinocyte differentiation followed by co-secretion of enzymes and other factors in lamellar bodies at the stratum granulosum / stratum corneum interface. Stratum corneum lipid disorganisation and altered epidermal barrier function are involved in several skin diseases and disorders, including dry skin. [24]

The **24-hour Moisturising complex** contains Avocado oil and Sunflower seed oil amongst others. Avocado oil nourishes the skin contributing to a smoother epidermis and helping to alleviate flakiness and dryness. Sunflower seed oil is rich in essential fatty acids (linoleic and linolenic fatty acids) playing an important role in skin barrier repair and function as well as promoting improved moisture, smoothness, and flexibility.

Immunologic and skin microbiome considerations in dry skin

One of the characteristics of the stratum corneum is its inherent immunologic competence which contributes to epidermal barrier repair and homeostasis. Resident epidermal immune cells sense and induce response signals to external pathogens, participating in a large feedback network to maintain a functional stratum corneum. A dysfunctional epidermal barrier, as seen with dry skin, can facilitate the penetration of allergens, irritants, and pathogens, activating the innate immune response. [24]

The immune properties of the epidermal barrier are closely linked to its microbiome. The skin microbiome consists of cutaneous bacteria, fungi, and viruses that participate in cross talk with the immune system and support functional epidermal homeostasis. Similar to the epidermal barrier, the broad and balanced skin microbiome protects against infection and pathogenic invasion from potentially harmful microbes. Several factors contribute to the stability of the skin microbiome, including endogenous factors (e.g. sebum, sweat and hormones), age and immunologic factors as well as exogenous factors (e.g. environment and lifestyle). The epidermal barrier is tightly regulated by cross talk among several innate systems, including the skin's immune system and microbiome. Dysfunction in any one of these systems has an influence on the others and might interfere with the integrity of epidermal function. [24]

Triple biotic complex contains prebiotics, probiotic lysates, and postbiotics to help rebalance the microbiome. Boosts the diversity of the microflora selectively, favouring species such as *S.epidermidis* for a healthier skin. Improves skin smoothness, radiance, and complexion.

Collagen degradation and synthesis in mature skin

Collagen provides the support matrix / mattress underpinning healthy skin and is a key determinant to the preservation of skin firmness and elasticity. Type I is the main collagen found in the skin, representing 80-90% of skin collagen. The proportion of the collagen types in skin change with age. Young skin is composed of 80% type I collagen and about 15% collagen type III. With age, the ability to replenish collagen naturally decreases by about 1.0% - 1.5% per year. This decrease in collagen is one of the characteristic hallmarks associated with the appearance of fine lines and deeper wrinkles. Moreover, in the dermis, fibrillar collagens, elastin fibres and hyaluronic acid, which are the major components of the extracellular matrix, undergo distinct structural and functional changes. [25]

The importance of Vitamin C to skin is unique in that ascorbic acid can act as a co-factor to several enzymes in the production of collagen, in addition to its role as an antioxidant in protecting against free radical damage. The importance of vitamin C in the production of functional collagen fibres has been shown to be dependent on its use as a cofactor in hydroxylation of proline residues in procollagen (which stabilises the triple helix structure) and lysine residues (which are used to cross-link fibres imparting structural rigidity and stability). [25]

Ascorbyl tetraisopalmitate (ATIP) has age-reducing signs benefits due to its cell revitalising and proliferation activity. It promotes collagen synthesis and downregulates the activity of collagen-degrading enzymes. The antioxidant action helps to protect the cells' DNA against UV-induced damage.

Melanogenesis in mature skin

With chronological ageing, the number of functional melanocytes gradually declines, and melanogenic activity, including tyrosinase activity, is reduced. However, the melanocytes in photo-exposed skin are relatively well-maintained compared with those of unexposed ageing skin, most likely due to persistent UV stimuli affecting melanocytes. Although it may be considered a protective mechanism to prevent the skin from photodamage, the resulting morphological and functional phenotype changes in melanocytes are induced, and subsequent, pigmentary disorders develop. [26]

Ascorbyl tetraisopalmitate promotes skin brightening and contributes to reducing hyperpigmentation. Its triple effect downregulates intracellular tyrosinase activity and melanin synthesis and helps to suppress melanocyte dendricity.

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