Technical Information

SKINMIMICS®

Providing the skin Protection, Prevention and Regeneration

Intended use

Active for skin care

Benefits at a glance

- Provides the skin **Protection, Prevention & Regeneration**
- Stimulates skin renewal
- Induces skin lipid formation especially in mature skin for improved barrier function
- Replenishes skin's own protecting lipid barrier
- Helps skin revitalization by improving elasticity & moisturization
- Activates skin's natural water management system
- Usage concentration: 0.5 – 5%

INCI (PCPC name)

Ceteareth-25; Glycerin; Cetyl Alcohol; Behenic Acid; Cholesterol; Ceramide NP; Ceramide NS; Ceramide EOS ; Ceramide EOP; Ceramide AP; Caprooyl Phytosphingosine; Caprooyl Sphingosine

Chemical and physical properties (not part of specifications)

Form	liquid
Active matter	About 2.2%

Introduction

As demographic forecasts predict that about 40% of the developed world will be older than 50 years of age by 2025 skin aging and its prevention becomes more and more relevant. With age the skin's natural functions slow down based on naturally occurring biological processes. Starting in the 20s the reduction will be more pronounced over time. The effects on skin will be accentuated in the group of people aged 50 years and above. Related to this age group the term of "mature skin" is commonly used. This is a result of biological changes that have occurred on every level of the skin. Due to, for example, a reduced cell metabolism the generation of new, healthy cells decelerates. This will eventually result in a defective skin surface leading to moisture loss and dry skin. Figure 1 shows the main characteristics of aging skin which will become more visible and perceivable with age.

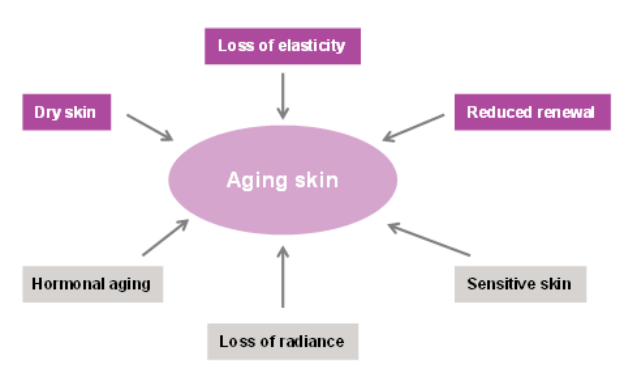

Figure 1: Characteristics of mature skin

Especially, dry skin conditions demonstrate that the barrier function of aging skin is strongly affected. Both lipid synthesis and cell differentiation is slowed down which leads to a deceleration of skin barrier renewal. As a result, the stratum corneum (SC) as the outermost layer of the skin is not rebuilt properly

and fast enough. Consequently, the skin barrier exhibits defects which are responsible for the loss of moisture.

Recognizing the specific needs of aging and especially mature skin, SKINMIMICS® is a specially designed combination of active ingredients to meet the expectations of consumers: the joy of feeling young and healthy.

SKINMIMICS® is a unique concentrate consisting of a mixture of skin-identical long chain ceramides and short-chain ceramides (SPHINGOKINES®), vegetable based cholesterol and behenic acid. The ceramides are based on Evonik's advanced technology: the necessary ceramide building blocks (phytosphingosine and sphingosine) are produced by a fermentative process which yields the skin-identical ceramide stereochemistry.

Taken together, SKINMIMICS® acts

- from the **outside of the skin** by providing **Protection**
  - → Replenishes skin's own protecting lipid barrier
- from the **inside of the skin** by providing **Prevention and Regeneration**
  - → Induction of skin lipid formation especially in mature skin for improved skin barrier function
  - → Stimulation of skin renewal
  - → Activation of the skin's natural water management system
  - → Revitalization by improving skin moisturization and elasticity
- **on aging skin** starting in the 20s when biological events are beginning to slow down
- **on mature skin** when biological events have manifested themselves in visible signs.

In vivo study overview conducted for claim support

All *in vivo* tests were carried out under standardized conditions in a climatic room (room temperature, 55% relative humidity).

Test	Number of panelists	Test concentration [%]	Measurement	Results
Biopsy study	10	5	qRT-PCR of a) Stratum corneum lipid formation markers, b) Differentiation markers, c) Water transport marker	a) Induction of SPT1, SPT2 & GlcT-1 b) Activation of TGM1, IVL, LOR, FLG c) Induction of AQP3
Moisturization & elasticity study	10	5	Skin hydration (Corneometer) Transepidermal water loss (Tewameter) Skin elasticity (Cutometer)	Improvement of skin moisturization & elasticity
Raman study	31	0.5 & 1 & 5	Raman Spectroscopy: a) Stratum corneum (SC) thickness a) Natural moisturizing factor (NMF) b) Water content Tewameter: Transepidermal water loss	Improvement of moisture content & skin barrier

Figure 2: Summary of *in vivo* studies

Stimulation of epidermal renewal – *in vivo* study

Based on *in vitro* results with human primary keratinocytes this study was performed to confirm the signaling potential of SKINMIMICS® on skin cell differentiation and lipid synthesis in an *in vivo* biopsy study. Measurements were done after 4 weeks of application.

The results were analysed with regard to an age dependency effect (above 50 and below 50 years of age corresponding to 6 and 4 volunteers, respectively).

After 4 weeks of treatment with SKINMIMICS® an up-regulation of the investigated genetic markers compared to the untreated skin area was observed (figures 3-5). The results show that the genetic response has been almost consistently about 2-fold within the younger age group. However, an increase on the genetic level even up to 4-fold for e.g. filaggrin was observed within the age group above 50 years.

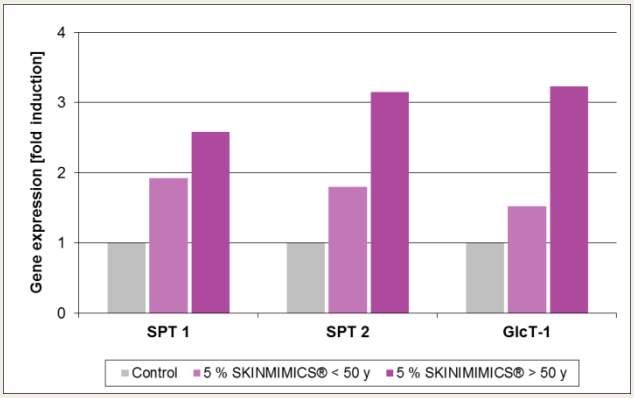

Figure 3: Gene expression of stratum corneum lipid formation markers after 4 weeks of treatment with

SKINMIMICS®. (SPT: Serine palmitoyltransferase, GlcT: Ceramide glucosyltransferase)

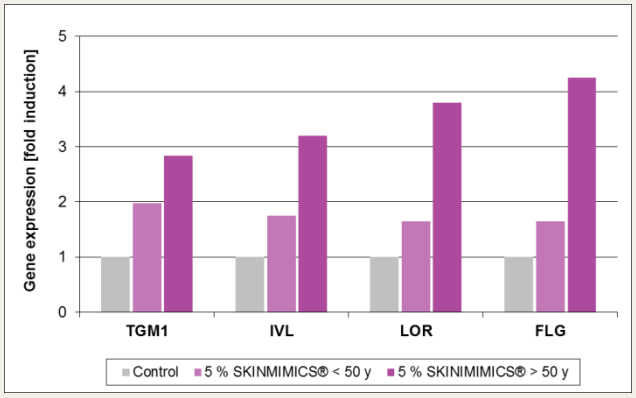

Figure 4: Gene expression of keratinocyte differentiation markers (TGM1: Transglutaminase 1, IVL: Involucrin, LOR: Loricrin) and NMF precursor (FLG: Filaggrin) after 4 weeks of treatment with SKINMIMICS®

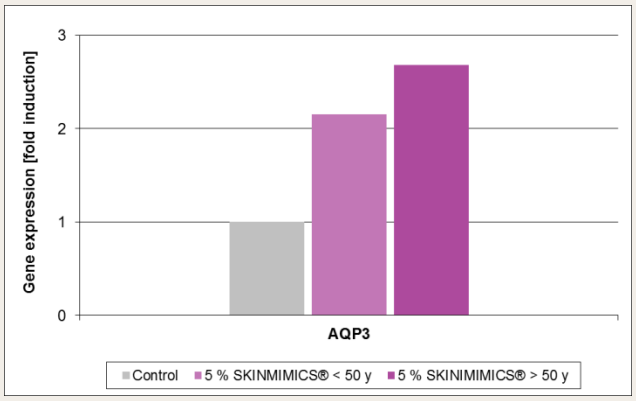

Figure 5: Gene expression of Aquaporin 3 after 4 weeks of treatment with SKINMIMICS®

The results of this *in vivo* study confirm the previous *in vitro* data which demonstrate that the application of SKINMIMICS® on skin cells leads to an activation of keratinocyte differentiation from within. Taken together, the generation of new corneocytes by differentiation and an increased lipid synthesis finally result in an improved barrier function.

In addition, factors that improve the natural water management system in the skin are also increased. Both the NMF precursor filaggrin and the water/glycerol transporter aquaporin 3 are induced by the treatment with SKINMIMICS® to ensure the supply of moisture within the skin.

The results strongly indicate a strengthening of the skin barrier function which leads to an improved skin moisturization and supplementation of moisture from within the skin.

Revitalization of the skin: Improvement of moisturization and skin elasticity – *In vivo* study

It has been demonstrated that SKINMIMICS® affects skin cell differentiation and lipid synthesis on the genetic level. This study was performed to demonstrate the impact of SKINMIMICS® on skin *in vivo*. After 4 weeks of treatment, skin hydration, transepidermal water loss and skin elasticity have been evaluated.

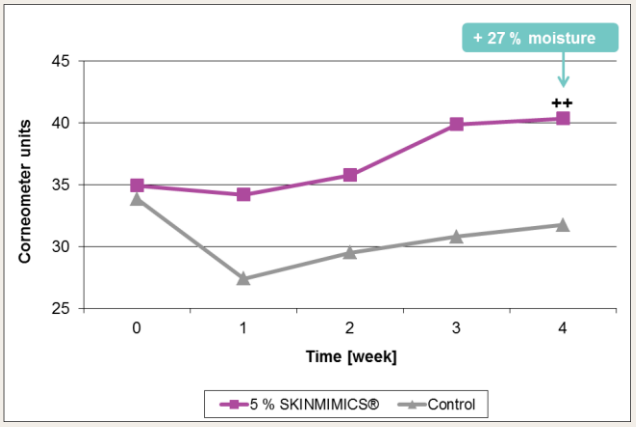

Figure 6: Skin hydration after 4 weeks of treatment with SKINMIMICS®. (Statistics: Student's t-test ++ p<0.01 vs. start); * compared to control

The application of 5% SKINMIMICS® led to a significant improvement of skin hydration. After 4 weeks of application the moisture content increased by 27% compared to the control (Figure 6).

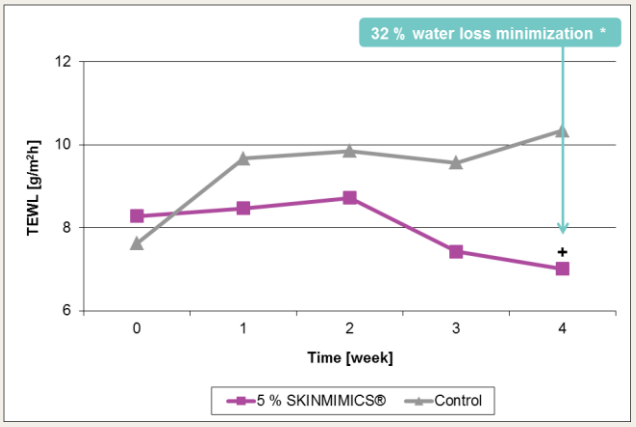

Figure 7: Transepidermal water loss (TEWL) after 4 weeks of treatment with SKINMIMICS®. (Statistics: Student's t-test + p<0.05 vs. start); * compared to control

The transepidermal water loss (TEWL) was significantly decreased after 4 weeks of application of 5% SKINMIMICS®. The water loss minimization improved by 32% compared to the control (Figure 7).

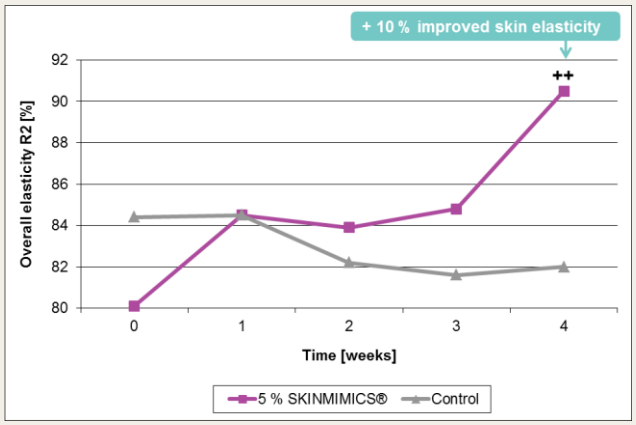

Figure 8: Overall skin elasticity (R2) after 4 weeks of treatment with SKINMIMICS®. (Statistics: Student's t-test ++ p<0.01 vs. start); * compared to control

After 4 weeks of application of 5% SKINMIMICS® the overall skin elasticity R2 was improved by 10% compared to the control (Figure 8). This increase is significant compared to the beginning of the study.

The results of this *in vivo* study show that SKINMIMICS® helps the skin to be revitalized due to an improved skin barrier function. Based on the previous *in vitro* data it was demonstrated that skin barrier has been improved resulting in a reduced TEWL, an increased skin moisture content, and an improved skin elasticity.

Improvement of the total epidermal moisturizing system – *In vivo* confocal Raman spectroscopy study

An additional *in vivo* investigation on skin revitalization has been performed in a study using Raman spectroscopy. This non-invasive, contactless optical technique allows determining the thickness of the stratum corneum, the concentration of NMF components, and the water content in the upper skin layers. The evaluation took place over a period of 4 weeks.

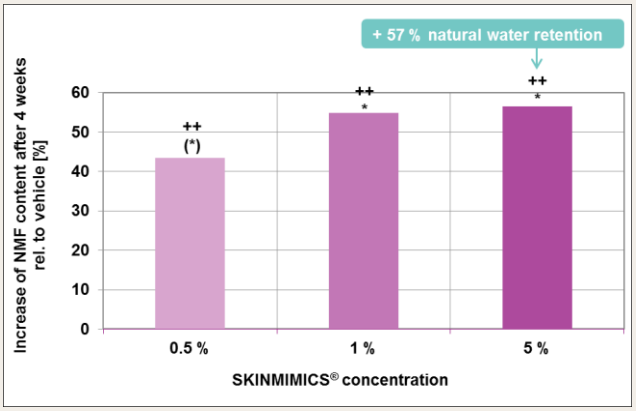

Figure 9: Content of Natural Moisturizing Factor (NMF) components relative to vehicle after 4 weeks of application of SKINMIMICS® in different concentrations. (Statistics: Student's t-test ++ p<0.01 vs. start; (*) p<0.1, * p<0.05 vs. vehicle); * compared to vehicle

The content of NMF components in the stratum corneum increased strongly within 4 weeks (up to 57% relative to the vehicle) of application of various concentrations of SKINMIMICS® (Figure 9).

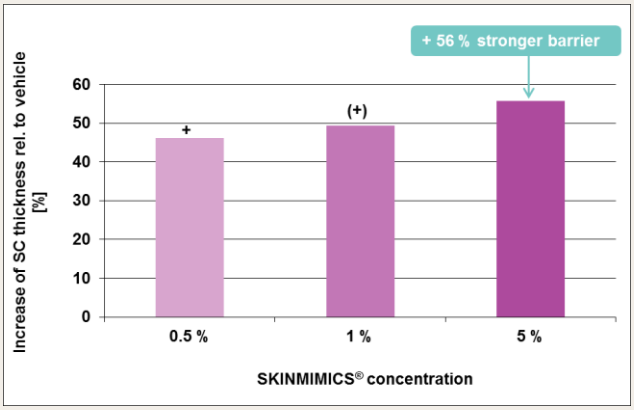

Figure 10: Stratum corneum thickness relative to vehicle after 4 weeks of application of SKINMIMICS® in different concentrations. (Statistics: Student's t-test (+) p<0.1, + p<0.05 vs start); * compared to vehicle

Also the thickness of the stratum corneum increased significantly up to 56% after 4 weeks of application of SKINMIMICS® relative to vehicle (Figure 10).

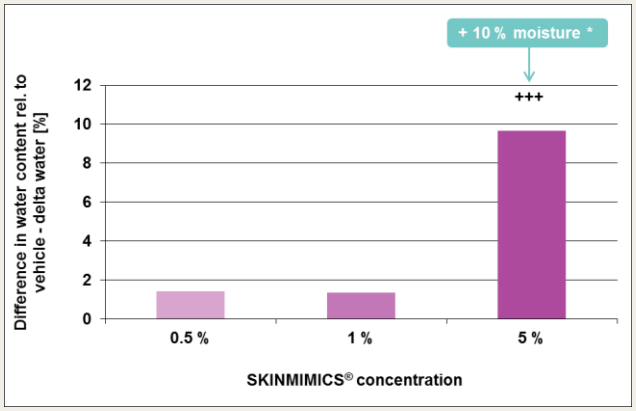

Figure 11: Water content in the skin relative to vehicle after 4 weeks of application of SKINMIMICS®. (Statistics: Student's t-test +++ p<0.001 vs. start , ** p<0.01 vs. vehicle); * compared to vehicle

The water content increase in the upper skin layers by almost 10% was highly significant after application of 5% SKINMIMICS® after 4 weeks compared to the vehicle formulation (Figure 11).

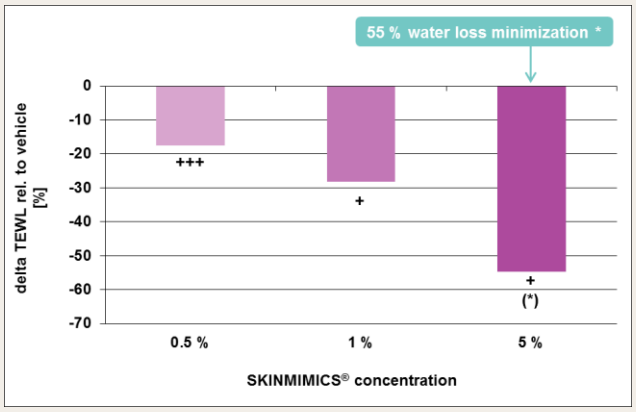

Figure 12: Transepidermal water loss (TEWL) of the skin after 4 weeks of application of SKINMIMICS® relative to vehicle (Statistics: Student's t-test + p<0.05, +++ p<0.001 vs. start , (*) p<0.1 vs. vehicle); * compared to vehicle

After 4 weeks the transepidermal water loss (TEWL) decreased significantly by about 18% at low and 55% at high concentrations of SKINMIMICS® relative to vehicle (Figure 12).

These results demonstrate that a concentration of 0.5-1% of SKINMIMICS® is sufficient for the revitalization of normal skin due to a replenishment of the skin's own protection barrier and the optimization of the total epidermal moisturizing system. Higher concentrations (5%), however, are strongly effective on mature skin above 50 years of age.

A detailed test summary report (technical dossier) is available on request.

Claim Summary

SKINMIMICS®

- Provides the skin Protection, Prevention & Regeneration
- Stimulates skin renewal
- Induces skin lipid formation especially in mature skin for improved barrier function
- Replenishes skin's own protecting lipid barrier
- Helps skin revitalization by improving elasticity & moisturization
- Activates skin's natural water management system

Formulation hints

SKINMIMICS® has a non-ionic character and is generally compatible with all relevant types of anionic and cationic raw materials in formulations.

Preparation of an O/W emulsion (cream or lotion):

SKINMIMICS® can be added directly to the water phase. When adding SKINMIMICS® to an existing O/W formulation containing liquid crystalline structures, the emulsion viscosity can drop as rearrangement of these liquid crystalline structures is possible. In this case, the emulsion viscosity can be readjusted by increasing the amount of consistency enhancers like TEGO® Alkanol 18 (Stearyl Alcohol) or by adding polymeric stabilizers like TEGO® Carbomer and/or Xanthan Gum.

Preparation of a W/O emulsion (cream or lotion):

It is possible to add SKINMIMICS® to the water phase of a W/O formula. High amounts might lead to phase inversion because SKINMIMICS® is based on the

hydrophilic O/W emulsifier TEGINACID® C (Ceteareth-25). This can normally be prevented by using a sufficient amount of suitable W/O emulsifier (e.g. ABIL® EM 90, ISOLAN® GPS or ISOLAN® PDI).

Recommended usage concentration

0.5 - 5%; clinically tested at different concentrations

Applications

- Skin barrier protection formulations
- Rejuvenating creams
- Skin regeneration & nourishing products
- Creams & serums for mature skin
- Skin moisturizing applications

Packaging

5 kg package

Storage

Store at 4 – 10 °C (unopened original packaging)

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in case of accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guideline formulations

Rejuvenating After Shave Balm CD 942/3	
Phase A	
TEGO® Care LTP (Sorbitan Laurate; Polyglyceryl-4 Laurate; Dilauryl Citrate)	2.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.00%
TEGOSOFT® TN (C12-15 Alkyl Benzoate)	5.00%
TEGO® Carbomer 140 (Carbomer)	0.15%
TEGO® Carbomer 141 (Carbomer)	0.15%
Xanthan Gum (Keltrol F; CPKelco)	0.10%
Phase B	
SKINMIMICS®	1.00%
Water	86.60%
Phase C	
Sodium Hydroxide (10% in water)	q.s.
Phase Z	
Preservative, Perfume	q.s.
Preparation: 1. Add phase A to phase B with stirring.[1)] 2. Homogenize. 3. Add phase C and stir well. [1)] **Important:** If phase A has to be charged into the vessel first, phase B must be added **without** stirring.	

Hydrating Body Lotion WR 6/06-32	
Phase A	
ISOLAN® GPS (Polyglyceryl-4 Diisostearate / Polyhydroxystearate/ Sebacate)	3.00%
Microcrystalline Wax (Paracera M, Paramelt B.V.)	0.10%
Hydrogenated Castor Oil	0.10%
TEGOSOFT® DEC (Diethylhexyl Carbonate)	6.00%
TEGOSOFT® TN (C12-15 Alkyl Benzoate)	6.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.80%
Phase B	
Glycerin	3.00%
Magnesium Sulfate Heptahydrate	1.50%
SKINMIMICS®	2.00%
Water	72.50%
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Heat phase A to approx. 80 °C.
2. Add phase B (80 °C or room temperature) slowly while stirring.
3. Homogenize for a short time.
4. Cool with gentle stirring below 30 °C and homogenize again.

Daily Revitalizing Lotion for Mature Skin F 9/06-5	
Phase A	
TEGO® Care LTP (Sorbitan Laurate; Polyglyceryl-4 Laurate; Dilauryl Citrate)	1.50%
TEGOSOFT® OP (Ethylhexyl Palmitate)	8.10%
TEGOSOFT® DC (Decyl Cocoate)	3.50%
TEGOSOFT® CI (Cetearyl Isononanoate)	3.00%
TEGO® Carbomer 140 (Carbomer)	0.15%
TEGO® Carbomer 141 (Carbomer)	0.15%
Xanthan Gum (Keltrol F; CPKelco)	0.10%
Phase B	
SKINMIMICS®	5.00%
Glycerin	3.00%
Water	75.50%
Phase C	
Sodium Hydroxide (10% in water)	q.s.
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Mix ingredients of phase A.
2. Combine phases A and B without stirring.
3. Homogenize.
4. Add phases C and Z and stir well.

[1] **Important:** If phase A has to be charged into the vessel first, phase B must be added **without** stirring.

Mature Skin Cream with Velvety Skin Feel MK 5/08-16	
Phase A	
ABIL® Care XL 80 (Bis-PEG/PPG-20/5 PEG/PPG-20/5 Dimethicone; Methoxy PEG/PPG-25/4 Dimethicone; Caprylic/Capric Triglyceride)	2.50%
TEGO® Alkanol 18 (Stearyl Alcohol)	2.00%
TEGIN® M Pellets (Glyceryl Stearate)	1.00%
Stearic Acid	0.60%
TEGOSOFT® DEC (Diethylhexyl Carbonate)	4.00%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.90%
TEGOSOFT® APS (PPG-11 Stearyl Ether)	3.00%
TEGOSOFT® OP (Ethylhexyl Palmitate)	4.50%
Simmondsia Chinensis (Jojoba) Seed Oil	1.00%
Tocopheryl Acetate	0.50%
Phase B	
Water	65.40%
Glycerin	3.00%
SKINMIMICS®	5.00%
Phase C	
TEGO® Carbomer 134 (Carbomer)	0.20%
TEGOSOFT® OP (Ethylhexyl Palmitate)	0.80%
Phase D	
Sodium Hydroxide (10% in water)	0.60%
Preservative, Perfume	q.s.

Preparation:

1. Heat phase A and B separately to approx. 80°C.
2. Add phase A to phase B with stirring. [1)]
3. Homogenize.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D below 40 °C.

[1)] **Important:** If phase A has to be charged into the vessel first, phase B must be added **without** stirring.

Skin Replenishing Serum MK 3/10-7	
Phase A	
TEGO® Care 165 (Gkyceryl Stearate; PEG-100 Stearate)	3.00%
TEGO® Alkanol 18 (Stearyl Alcohol)	0.50%
TEGOSOFT® APM (PPG-3 Myristyl Ether)	3.00%
Isononyl Isononanoate	4.00%
Hydrogenated Polyisobutene	3.00%
Tocopherol	0.50%
Phase B	
Water	77.75%
Butylene Glycol	5.00%
SKINMIMICS®	2.50%
Phase C	
Polyacrylamide (and) C13-14 Isoparaffin (and) Laureth-7, (Sepigel 305, Seppic)	0.75%
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Heat phase A and B separately to approx. 70 - 75°C.
2. Add phase A to phase B with stirring.[1)]
3. Homogenize.
4. Cool with gentle stirring.
5. Add phase C below 40 °C.

[1)] **Important:** If phase A has to be charged into the vessel first, phase B must be added **without** stirring.

H 06/15

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