

## TEGO® Stemlastin

Combats the appearance of chronological aging

- Retains a youthful appearance
- Reduces skin roughness, yielding skin that appears smoother and more radiant
- Improves appearance of tone and skin resiliency.
- Delivers proven sustainability
- Usage concentration: 1 – 5%

Personal Care

## INCI name (PCPC name)

Cyanidium Caldarium Extract; Water

## Chemical and physical properties (not part of specifications)

Form	Aqueous solution
Active matter	Approx. 2.5% dry matter based on algae biomass

## Introduction

During the chronological aging process epidermal skin stem cells become less effective, meaning that the renewing and repairing activity of the epidermis is reduced. In addition to that, fewer and fewer elastic fibers are synthesized which induces a progressive loss of skin elasticity.

TEGO® Stemlastin, a standardized extract of the micro alga *Cyanidium caldarium* may help retain a youthful appearance and reduce the signs of chronological aging. Youthful skin tends to have greater amounts of elastin (Figure 1).

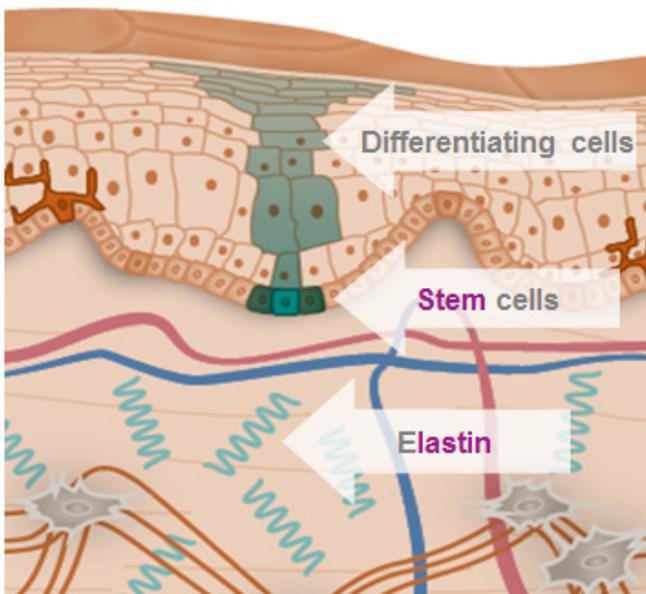


Figure 1: Structure of skin

The algae *Cyanidium caldarium* is able to survive under extreme environmental conditions. Therefore, the extract delivers a special intracellular composition of extremolytes in the form of mineral nutrients, amino acids, algae polyphenols and is enriched in gamma amino butyric acid (GABA).

The strain that is used for the production of TEGO® Stemlastin was isolated on the Sunda Islands in Southeast Asia from mount Lawu fumaroles on the Java Island.

This production (Figure 2) of the bioactive algae extract TEGO® Stemlastin is a natural and eco-friendly process from biorenewables without external organic carbon sources. The cells grow only in the

presence of light and nutrients. After cultivation the algae cells are processed by a proprietary mild extraction method followed by a filtration step enriching the bioactive compounds.

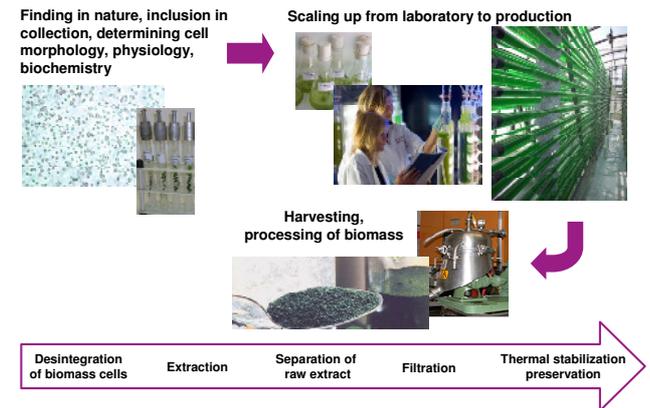


Figure 2: *Cyanidium caldarium* cultivation and extraction.

TEGO® Stemlastin is COSMOS and NaTrue certified and allows development of sustainable, responsible and natural cosmetic products.

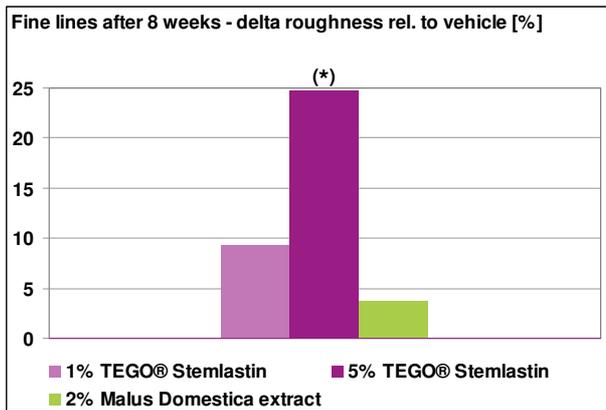
## In vitro studies

Several *in vitro* studies were carried in cell culture incubated with *Cyanidium* extract. Commercially available epidermal keratinocyte progenitor cells and dermal fibroblasts were used in these experiments.

The results of the *in vitro* models imply that TEGO® Stemlastin may provide even skin texture and help retain a youthful appearance. Among other activities, there may also be a reduction in the appearance of fine lines and wrinkles, leading to younger looking supple skin. (not shown).

## In vivo elasticity study – inner forearm

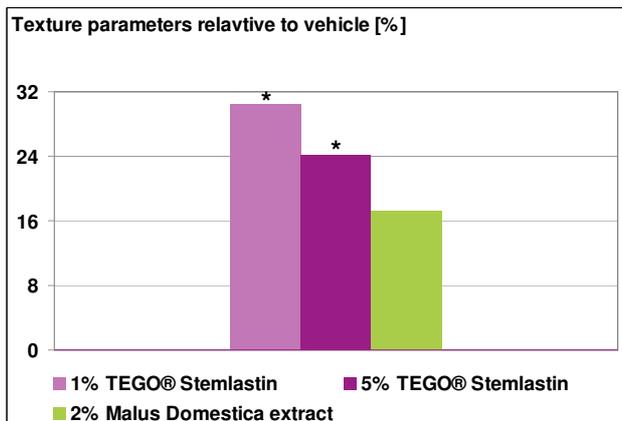
Following the initial *in vitro* results, *in vivo* studies were carried out to evaluate skin appearance following topical application of TEGO® Stemlastin. Male and female volunteers, aged between 33 and 59 years were recruited for this study, which was conducted in winter time. 19 volunteers received an O/W formulation containing 1% TEGO® Stemlastin, 21 panelists received the formulation containing 5% TEGO® Stemlastin and 20 panelists received the formulation with 2% *Malus Domestica* extract as a market reference product. 20 panelists received the formulation without active ingredient (vehicle). Test formulations were applied twice daily for 8 weeks on the inner forearm in a randomized test design. Prior to application and after 8 weeks skin elasticity and skin surface parameters were determined. Skin elasticity measurements were conducted using a Cutometer MPA 580 (Courage & Khazaka, Cologne, Germany) (Figure 3).



**Figure 3: Improvement of fine lines expressed as roughness parameters after 8 weeks of application, calculated relative to vehicle treated skin**

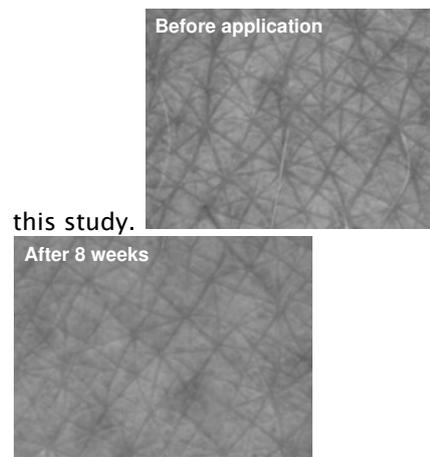
After 8 weeks of applying TEGO® Stemlastin to the inner forearm, a reduction in the appearance of fine lines is observed. These effects can be achieved with 1% TEGO® Stemlastin and they are significant when using 5% TEGO® Stemlastin.

These effects are in line with an improved skin texture (Figure 4): Skin texture parameters are significantly improved compared to vehicle treatment already with the lower concentration of 1% TEGO® Stemlastin. Using a higher concentration of the extract does not further improve appearance of skin texture.



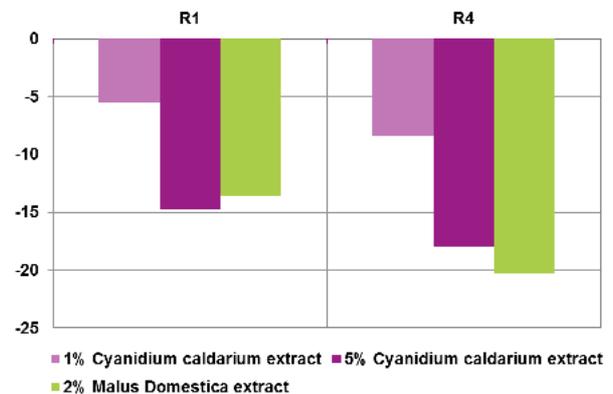
**Figure 4: Skin texture parameters after 8 weeks of application, calculated relative to the vehicle treated skin**

Improvement in texture leads to a smoother and more radiant skin surface. After 8 weeks of treatment with TEGO® Stemlastin, the skin appears to be more even and fine lines are visibly flattened (Figure 5). Malus Domestica extract does not show significant effects with the tested concentration in



**Figure 5: Digital images of the skin surface before and after 8 weeks of application of 5% TEGO® Stemlastin.**

Skin tone was assessed by measuring deformation of the skin after stretching after application of 5% TEGO® Stemlastin compared to vehicle treatment (Figure 6).



**Figure 6: Skin tone parameters after 8 weeks of application, calculated relative to vehicle treated skin (significance: \*p<0.05 vs. start, \*p<0.05 vs. vehicle, \*\*p<0.01 vs. vehicle).**

R1 describes the ability of the skin to bounce back after stretching and R4 describes skin tone fatigue. A decrease in both parameters leading to skin that feels more supple and toned.

In general, Malus Domestica extract performs in a similar way when it comes to skin tone compared to TEGO® Stemlastin. Nevertheless, the cost/performance ratio is much better with TEGO® Stemlastin.

### ***In vivo* study – gluteal region and face**

The study was performed at the Institute of Molecular Preventive Medicine (IUF) at the Heinrich Heine University in Duesseldorf, Germany, under the supervision of Prof. Krutmann.

A placebo controlled study enrolling 20 healthy volunteers (female and male) from 50 to 77 years of age was performed in two parts.

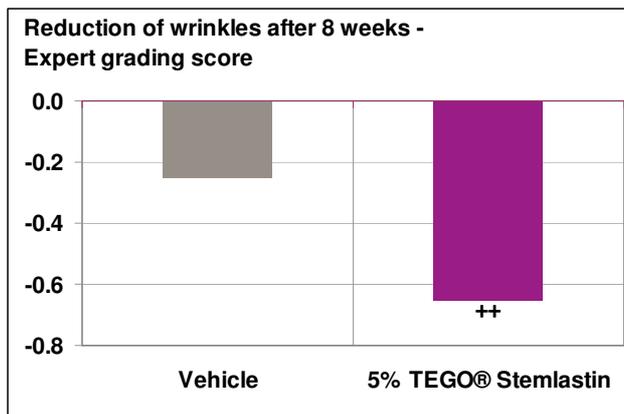
For the biopsy study, the volunteers applied once daily in the morning 2 mg/cm<sup>2</sup> of different O/W test formulations containing either no active ingredient (vehicle), 1% or 5% TEGO® Stemlastin or 0.1% Retinol (market standard, 0.2% of a commercial 50% Retinol solution were used) on the upper medial quarter of the gluteal region using a randomized test design. After 8 weeks treatment 6 mm punch biopsies were taken from the four different testing areas and analysis was carried out (results not shown).

The second part of the study was performed on the face. The volunteers applied the O/W formulation without active ingredient on one part of the face and the formulation containing 5% TEGO® Stemlastin on the other side (half-side test design) once daily in the morning for a period of 8 weeks.

Before and after the treatment phase digital images of the face were taken, and image analysis was performed using a VISIA-CR facial imaging system (Canfield Scientific, Inc., NJ, USA). Furthermore, visual expert grading was performed. Dermatologists graded the degree of wrinkle appearance after 8 weeks on a 5 grade scale (1=low wrinkle appearance, 5=high wrinkle appearance) compared to the beginning of the study.

Volunteers applied two test formulations on the face during this study and the appearance of wrinkle reduction was analyzed after the application period.

Results from expert grading, where wrinkle formation was evaluated on a 5 grade scale before and after the application of either the vehicle formulation on one side of the face or the formulation with 5% TEGO® Stemlastin on the other side, are shown below (Figure 7).



**Figure 7: Expert grading of wrinkle formation by treatment with 5% TEGO® Stemlastin or vehicle formulation after 8 weeks (significance: ++p<0.01 vs. start).**

The investigation of the experts shows that a significant reduction in the appearance of wrinkles could be observed after 8 weeks treatment with 5% TEGO® Stemlastin.

This is also visible in the image analysis with the VISIA-CR device (Figure 8).



**Figure 8: Images of crow-feet before (top) and after (bottom) application of 5% TEGO® Stemlastin for 8 weeks. The right side shows the analysis of the face with the VISIA-CR software. The green lines reflect the wrinkle structures on the face.**

The reduction in appearance of wrinkles after treatment with TEGO® Stemlastin, can be seen in the pictures on the left side, and is further illustrated using the VISIA-CR analysis software (right side; green lines reflect wrinkle structures on the face).

Taken together, TEGO® Stemlastin is an innovative cosmetic ingredient which leads to a youthful appearance and delay in the appearance of the familiar signs of chronological aging.

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

#### Claim summary

- Reduces skin roughness, yielding skin that appears smoother and more radiant Improve appearance of tone and skin resiliency.
- Retains a youthful appearance
- Delivers proven sustainability

#### Patent position

A patent application describing manufacturing process and cosmetic application of Cyanidium caldarium extract was filed by Evonik Industries AG (WO2013023873A1).

To the best of our knowledge, there are no 3rd party rights covering the usage of TEGO® Stemlastin in cosmetic formulations.

#### Formulation hints

TEGO® Stemlastin is water soluble.

Preparation of an O/W emulsion (cream or lotion):  
The emulsion is prepared as usual. TEGO® Stemlastin

is added during the cooling process at temperatures below 40 °C.

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

The emulsion is prepared as usual. TEGO® Stemlastin is added at temperatures below 40 °C. Afterwards the emulsion is cooled to 30 °C and homogenized again.

**Recommended usage concentration**

Recommended use level 1–5%; clinically tested at different concentrations.

**Possible applications**

- Anti-aging products Rejuvenating products for face and body care
- (night cream, serum, mask)
- Natural anti-wrinkle products

Sun care

**Packaging**

5 kg

**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 accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

## Guideline Formulations

<b>Power Serum For Aged Skin MM 216/2</b>	
<b>Phase A</b>	
TEGO <sup>®</sup> Care 450 (Polyglyceryl-3 Methylglucose Distearate)	2.0%
TEGOSOFT <sup>®</sup> DEC (Diethylhexyl Carbonate)	5.0%
TEGOSOFT <sup>®</sup> OP (Ethylhexyl Palmitate)	5.0%
TEGOSOFT <sup>®</sup> OER (Oleyl Erucate)	1.5%
Avocado (Persea Gratissima) Oil	1.5%
<b>Phase B</b>	
TEGO <sup>®</sup> Pep 4-17 (Tetrapeptide-21; Glycerin; Butylene Glycol; Aqua)	2.0%
HyaCare <sup>®</sup> 50 (Hydrolyzed Hyaluronic Acid)	0.1%
Glycerin	3.0%
Water	75.9%
<b>Phase C</b>	
TEGO <sup>®</sup> Carbomer 134 (Carbomer)	0.2%
TEGOSOFT <sup>®</sup> OP (Ethylhexyl Palmitate)	0.8%
<b>Phase D</b>	
TEGO <sup>®</sup> Stemlastin (Cyanidium Caldarium Extract; Water)	5.0%
<b>Phase E</b>	
Sodium Hydroxide (10%)	q.s.
<b>Phase Z</b>	
Preservative, Perfume	q.s.
<b>Preparation:</b>	
<ol style="list-style-type: none"> <li>1. Heat phase A and B separately to approx. 80 °C.</li> <li>2. Add phase A to B with stirring. <sup>1)</sup></li> <li>3. Homogenize.</li> <li>4. Cool with gentle stirring to approx. 60 °C and add phase C.</li> <li>5. Homogenize for a short time.</li> <li>6. Cool with gentle stirring and add phase D and E below 40 °C.</li> </ol>	
<sup>1)</sup> <b>Important:</b> If phase A has to be charged into the vessel first, phase B must be added without stirring	

<b>Natural cell Active Rejuvenation CD 997/3</b>	
<b>Phase A</b>	
TEGO <sup>®</sup> Care PSC 3 (Polyglyceryl-3 Stearate/Citrate)	3.0%
TEGIN <sup>®</sup> M Pellets (Glyceryl Stearate)	2.0%
TEGO <sup>®</sup> Alkanol 18 (Stearyl Alcohol)	1.0%
TEGOSOFT <sup>®</sup> DO (Decyl Oleate)	10.0%
TEGOSOFT <sup>®</sup> AC (Isoamyl Cocoate)	5.0%
TEGOSOFT <sup>®</sup> OER (Oleyl Erucate)	3.0%
<b>Phase B</b>	
Glycerin	3.0%
Water	67.3%
<b>Phase C</b>	
Xanthan Gum	0.5%
<b>Phase D</b>	
TEGO <sup>®</sup> Stemlastin (Cyanidium Caldarium Extract; Water)	5.0%
<b>Phase E</b>	
Sodium Hydroxide (10% in water)	0.2%
<b>Phase Z</b>	
Preservative, Perfume	q.s.
<b>Preparation:</b>	
<ol style="list-style-type: none"> <li>1. Heat phase A and B separately to approx. 80 °C.</li> <li>2. Add phase A to B with stirring. <sup>1)</sup></li> <li>3. Homogenize.</li> <li>4. Cool with gentle stirring to approx. 40 °C and add phase C.</li> <li>5. Homogenize for a short time.</li> <li>6. Cool with gentle stirring and add phase D and E below 40 °C.</li> </ol>	
<sup>1)</sup> <b>Important:</b> If phase A has to be charged into the vessel first, phase B must be added without stirring	

<b>Youth intensifying Cream</b>	
<b>CD 997/5</b>	
<b>Phase A</b>	
TEGO® Care PSC 3 (Polyglyceryl-3 Stearate/Citrate)	3.0%
TEGIN® M Pellets (Glyceryl Stearate)	2.0%
TEGO® Alkanol 18 (Stearyl Alcohol)	1.0%
TEGOSOFT® DO (Decyl Oleate)	10.0%
TEGOSOFT® AC (Isoamyl Cocoate)	5.0%
TEGOSOFT® OER (Oleyl Erucate)	3.0%
<b>Phase B</b>	
Glycerin	3.0%
Water	69.0%
<b>Phase C</b>	
Xanthan Gum	0.5%
<b>Phase D</b>	
TEGO® Stemlastin (Cyanidium Caldarium Extract; Water)	3.0%
<b>Phase E</b>	
TEGO® Turmerone (Curcuma longa (turmeric) root extract	0.3%
<b>Phase E</b>	
Sodium Hydroxide (10% in water)	0.2%
<b>Phase Z</b>	
Preservative, Perfume	q.s.
<b>Preparation:</b>	
<ol style="list-style-type: none"> <li>1. Heat phase A and B separatley to approx. 80 °C.</li> <li>2. Add phase A to B with stirring. <sup>1)</sup></li> <li>3. Homogenize.</li> <li>4. Cool with gentle stirring to approx. 40 °C and add phase C.</li> <li>5. Homogenize for a short time.</li> <li>6. Cool with gentle stirring and add phase D and E below 40 °C.</li> </ol>	
<sup>1)</sup> <b>Important:</b> If phase A has to be charged into the vessel first, phase B must be added without stirring	

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(Status: April, 2008)

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