CORUM

Solution for aging skin

C-Pep™

Corum Peptides

How Does Skin Age

Factors

- Intrinsic aging
- Photoaging
- Oxidative Stress
- Glycation

CORUM

Peptides

Definition

Peptides are miniature fragment of skin's protein made up of amino acid. They play the role of messenger signaling dermis to synthesize materials necessary to keep skin young and healthy.

C-Pep™ peptides are gentle, non-irritating, odorless and PEG-free.

Active \ Solution	Water Soluble	Oil Dispersible
	Glycerin	Caprylic/Capric Triglyceride
Palmitoyl Dipeptide-10	C-Pep™ Nutecyl	C-Pep™ Nutecyl **CC**
Palmitoyl Tripeptide-1	C-Pep™ Tricoll	C-Pep™ Tricoll **CC**
Palmitoyl Tetrapeptide-7	C-Pep™ Defensyl	C-Pep™ Defensyl **CC**
Palmitoyl Hexapeptide-12	C-Pep™ Elastyl	C-Pep™ Elastyl **CC**

C-Pep™ Series

Definition

C-Pep™ Nutecyl

Palmitoyl Dipeptide-10

DNA Protective Peptide

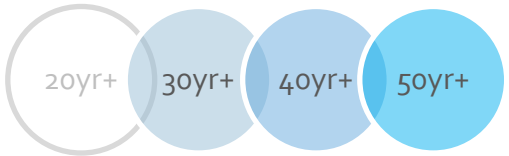
- DNA protection
- Anti-glycation

C-Pep™ Tricoll

Palmitoyl Tripeptide-1

Collagen Booster Peptide

- Collagen synthesis
- Stem cell proliferation

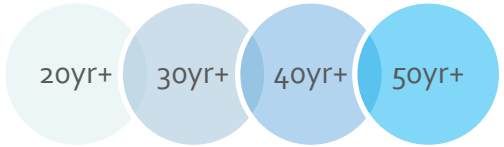


C-Pep™ Defensyl

Palmitoyl Tetrapeptide-7

Skin Strengthening Peptide

- Anti-inflammation
- Anti-photoaging

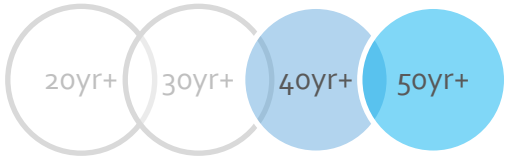


C-Pep™ Elastyl

Palmitoyl Hexapeptide-12

Skin Firming Peptide

- Elastin synthesis
- Fibroblast proliferation



CORUM

C-Pep™ Nutecyl

Palmitoyl Dipeptide-10

DNA protective peptide

Anti-glycation
Reduce AGE formation

DNA protection
Protect skin DNA

CORUM

C-Pep™ Nutecyl

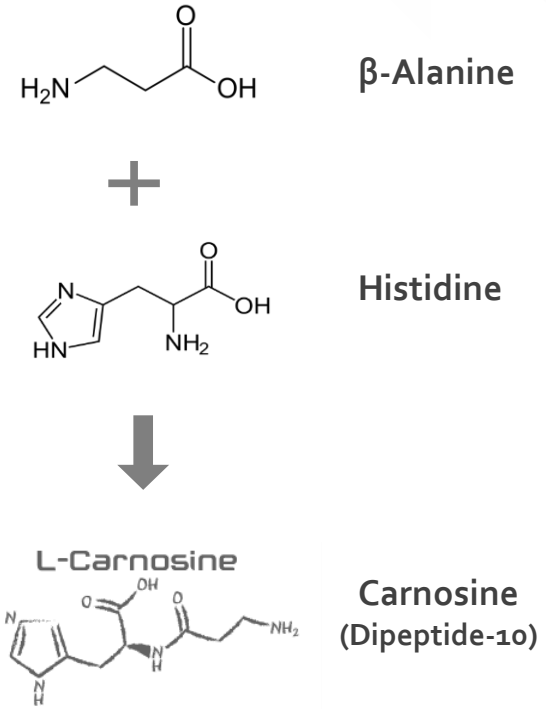
Palmitoyl Dipeptide-10

Properties:

- Anti-glycation
- DNA protection
- Restore proteasome activity

Mechanism:

C-Pep™ Nutecyl is made of amino acids of alanine and histidine, which is structural identical to carnosine. It protects DNA against free radical damages and prevent glycation to the skin.



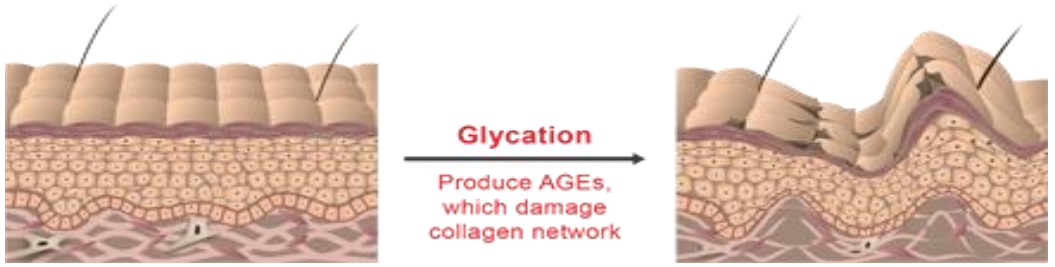
Anti-glycation

Mechanism

The Glycation Process

Glycation is the chemical process that may occur either inside the body or outside the body. It is the process of covalent boding of a sugar molecular (glucose or fructose) to a protein and leaving them unstable to function properly. In skin, the advanced end products (AGEs) alters the flexibility collagen and prevent skin from remaining smooth and elastic.

Skin Appearance



Healthy Skin

Aging Skin
Dull and wrinkled

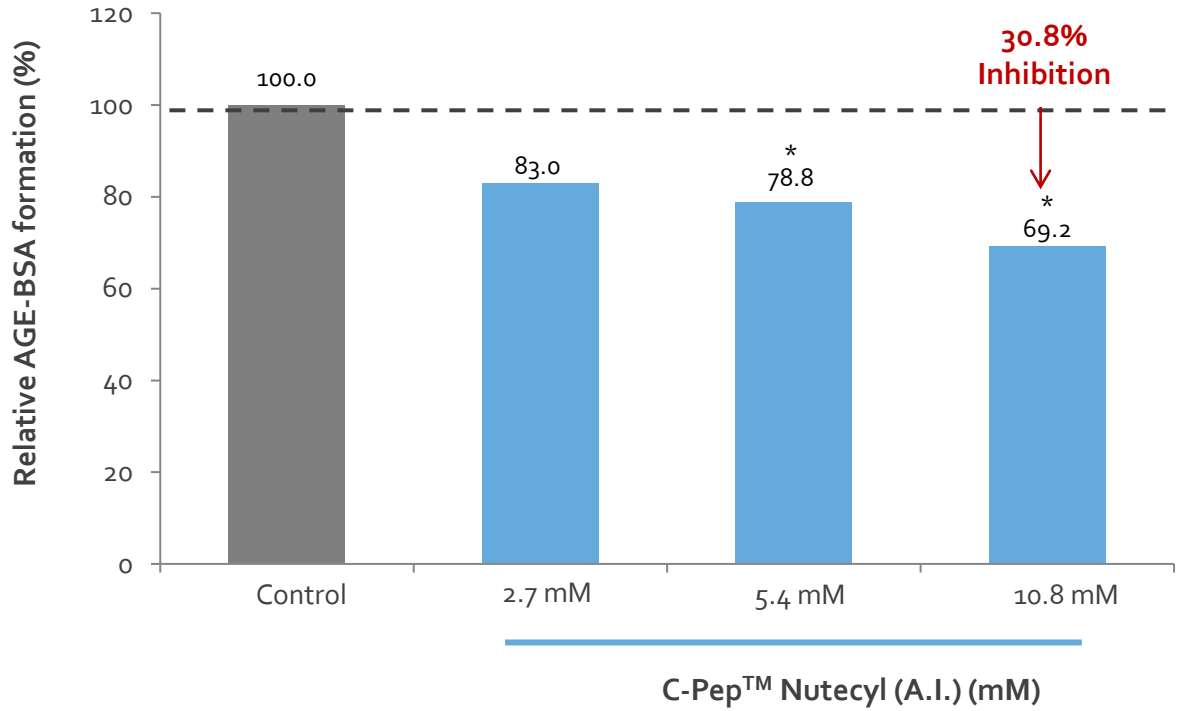
- Become rigid
- Loss of elasticity
- Accelerate aging
- Slow cell turnover
- Wrinkle formation
- Weaken barrier function

Efficacy Study

Anti-glycation

AGE-BSA Formation

BSA (bovine serum albumin) + Fructose → AGEs-BSA formation (Advanced Glycation End Product)



*p<0.05, **<p<0.01, ***p<0.001

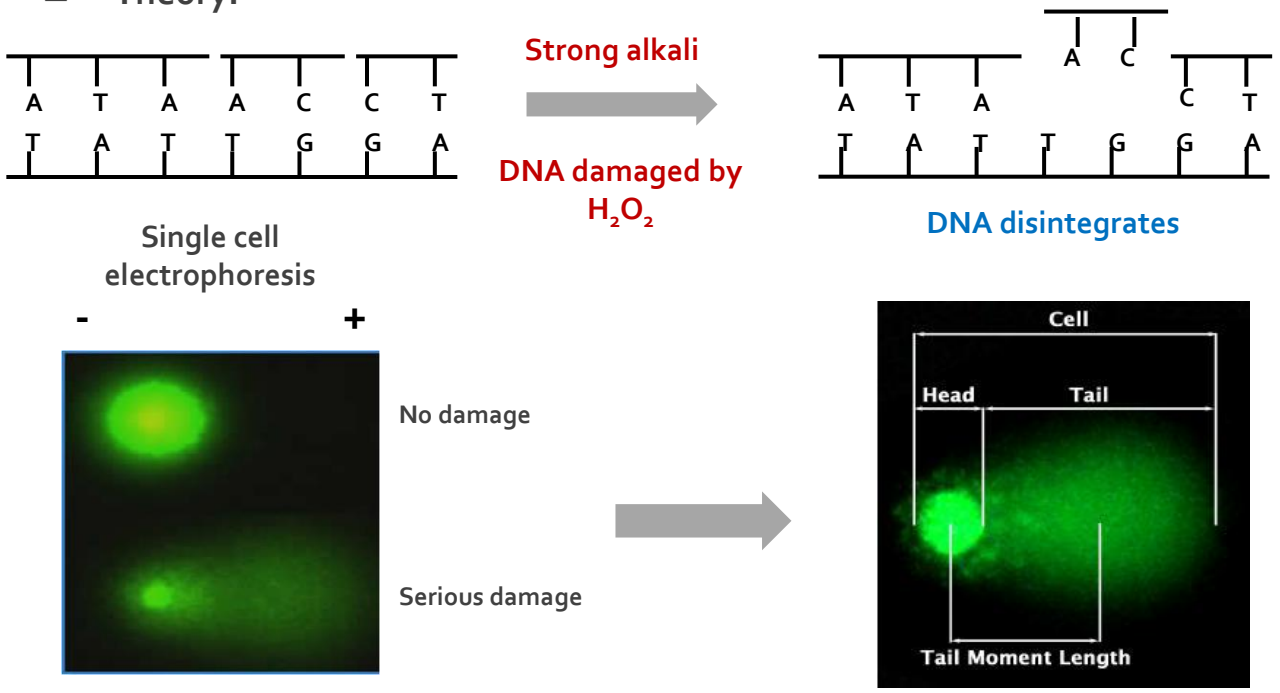
Corum R&D In-House Test. Feb. 2019.

DNA Protection

Mechanism

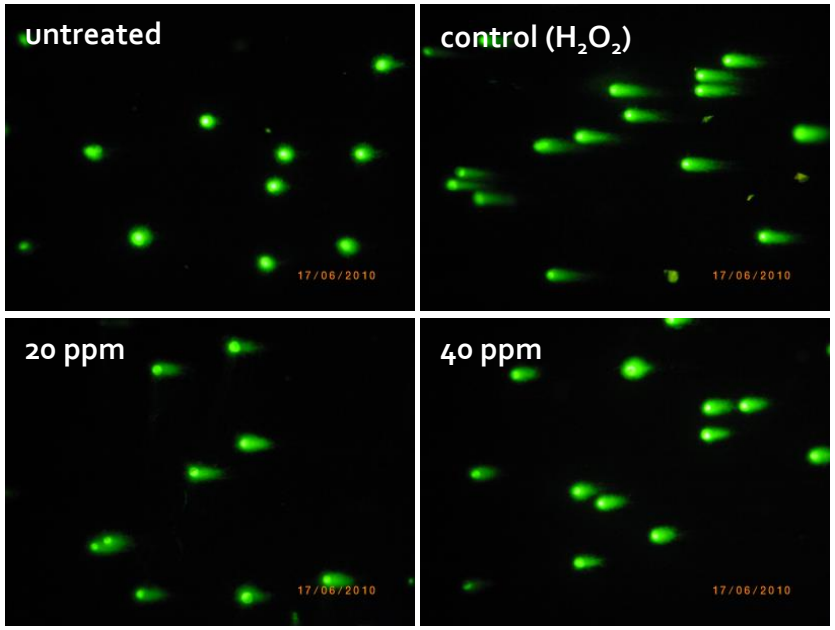
DNA Protection: Comet Assay

- **Method:** Single Cell Gel Electrophoresis Assay – Comet Assay
- **Theory:**



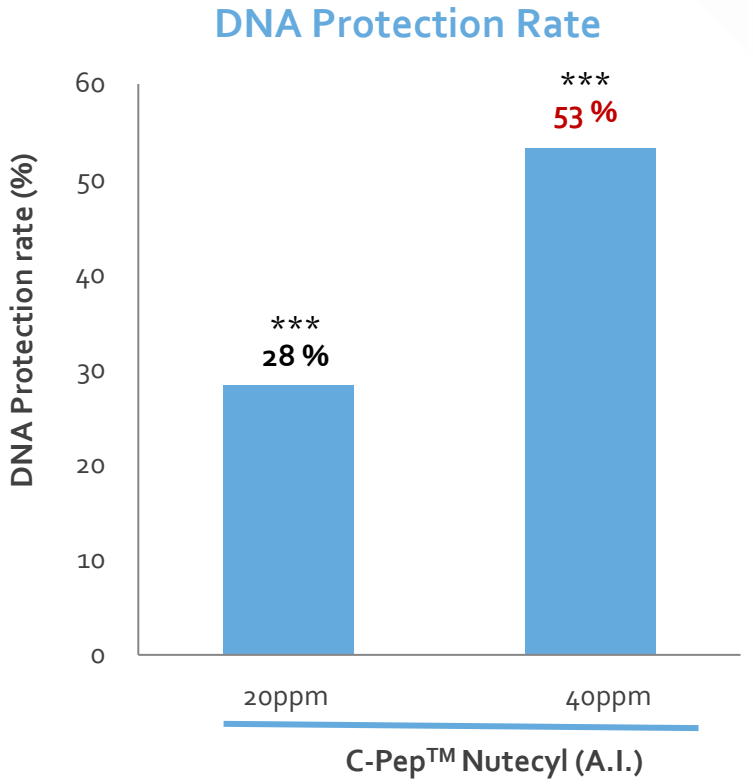
Efficacy Study

DNA comet assay



DNA Comet Assay

*Cell Line: Human fibroblast



*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. 2010.

C-Pep™ Nutecyl

Palmitoyl Dipeptide-10

Benefits:

- Reduce AGEs formation
- Minimize premature skin aging
- Fight against anti-oxidant stress
- Compatible with cosmetic ingredients
- Excellent chemical stability; also good for makeup

CORUM

C-Pep™ Tricoll

Palmitoyl Tripeptide-1

Collagen boosting peptide

Heat shock protein production
Increase Heat shock protein (HSP) 47 production

Strengthen ECM
Inhibit degradation enzyme MMP-1

collagen synthesis
Increase collagen production

C-Pep™ Tricoll

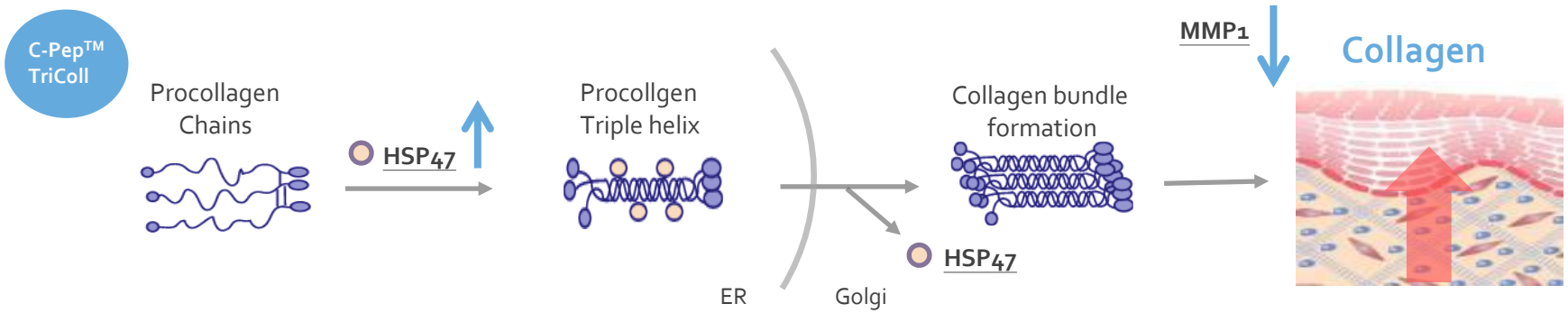
Palmitoyl Tripeptide-1

Properties:

- Stimulate collagen synthesis in skin fibroblasts
- Strengthen ECM and connective tissue
- Increase production of heat shock protein to stabilize pro-collagen

Mechanism:

C-Pep™ Tricoll stimulates expression of HSP47 proteins which help assembly and regulate procollagen I to triple helix form and transport it to Golgi. Furthermore, C-Pep™ Tricoll promotes epidermal proliferation as well as stimulate collagen synthesis. It also inhibits MMP-1 productions to prevent collagen degradation.

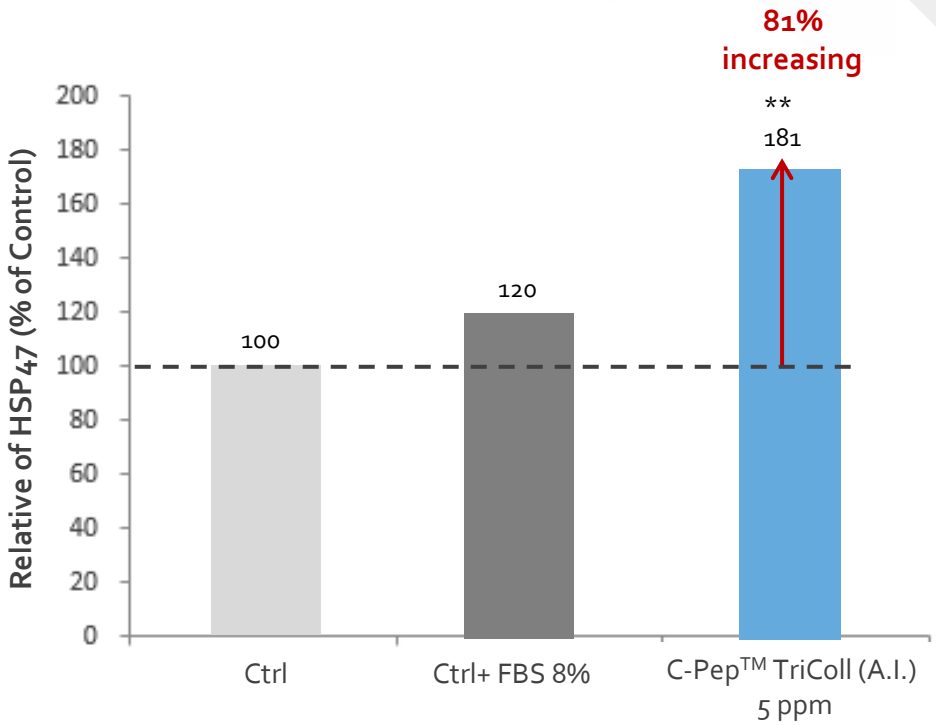


Efficacy Study

HSP Stimulation

Heat shock protein (HSP) 47 is a collagen-specific molecular chaperone which facilitates the synthesis of good quality procollagen I and also assists transportation of collagen chains from the endoplasmic reticulum (ER) to Golgi for the maturation phase. It prevents aggregation abnormal procollagen and assists the proper assembly of the triple helix folding in a zipper-like manner.

Stimulation of **HSP 47** expression



C-Pep™ TriColl increases HSP 47 protein expression up to 81%

Protein level (Western blot)

*Cell Line: NHDF

*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. Jul 2017.

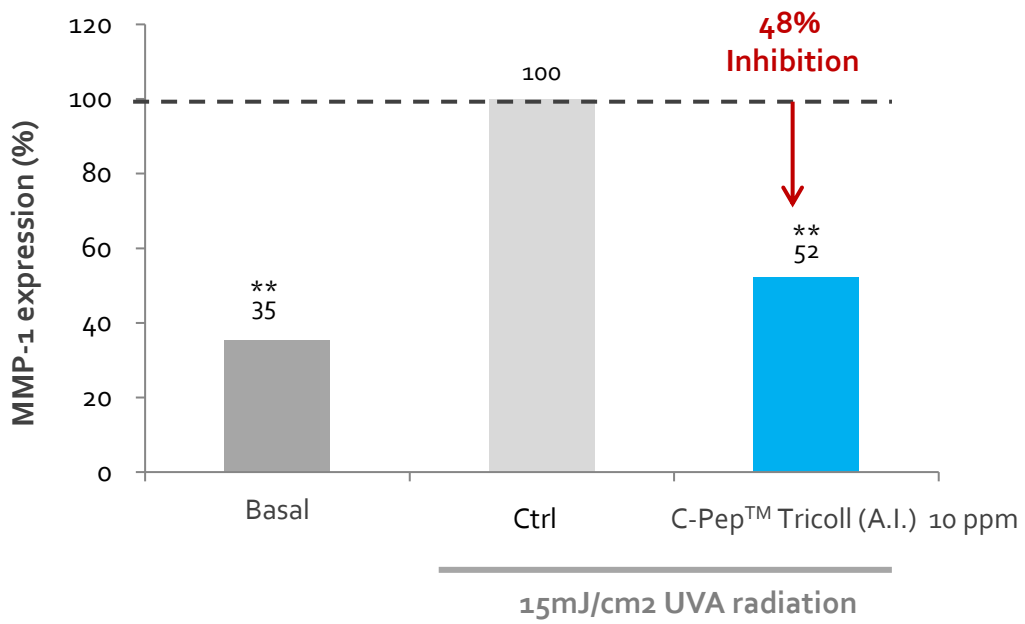
Efficacy Study

ECM Degradation Enzyme MMP-1

Protein level (ELISA)

*Cell Line: NHDF

Inhibition of ECM degradation enzyme **MMP-1**



C-Pep™ TriColl protects skin collagen by down-regulating the synthesis of MMP-1 to 48% following exposure to UVA radiation

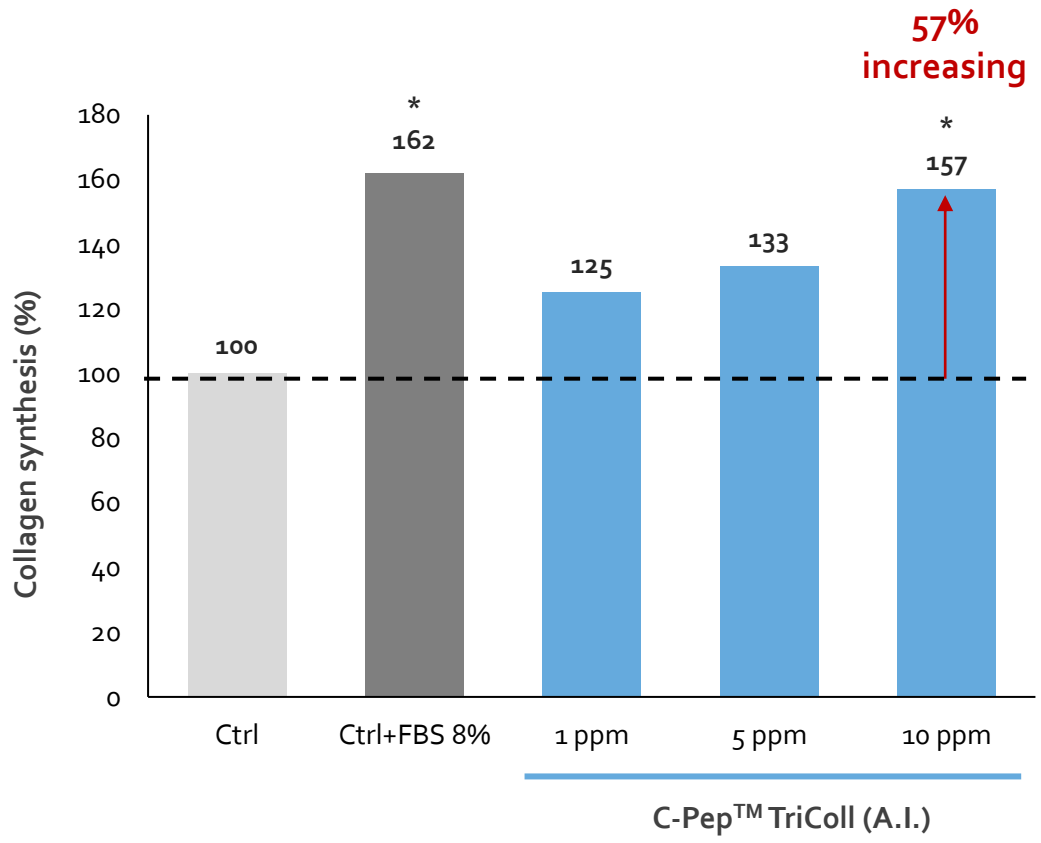
*p<0.05, **<p<0.01, ***p<0.001

CORUM Internal Report. Mar. 2018.

Efficacy Study

Collagen Synthesis

Stimulation of Natural Collagen Synthesis



Protein level (Western blot)

*Cell Line: NHDF

C-Pep™ TriColl can stimulate collagen synthesis up to 57% at 10 ppm and perform in a dose dependent manner.

*p<0.05, **<p<0.01, ***p<0.001

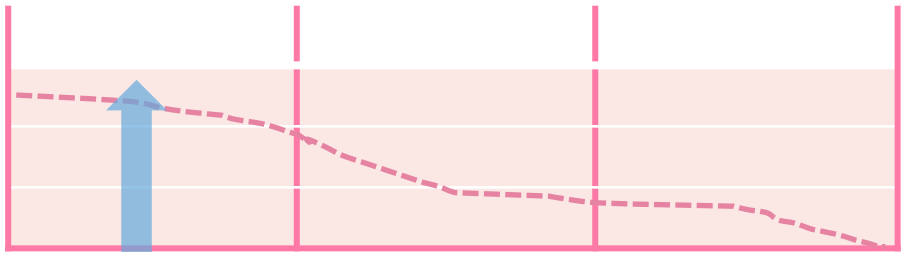
Corum R&D In-House Test. Jul. 2017.

Efficacy Study

Collagen Synthesis

Protein level (Immunofluorescence)

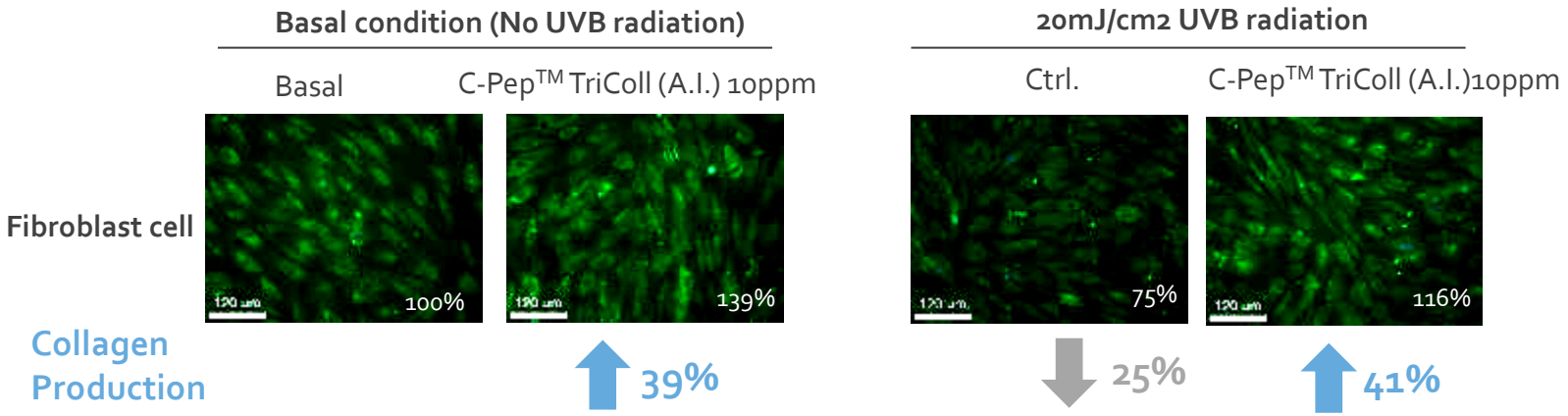
*Cell Line: Human fibroblast



Collagen level declined
Wrinkle formation

Basal condition (No UVB radiation)

20mJ/cm2 UVB radiation



C-Pep™ TriColl stimulates collagen production before and after UVB radiation

Corum R&D In-House Test. Sep. 2018.

C-Pep™ Tricoll

Palmitoyl Tripeptide-1

Benefits:

- Stimulate collagen synthesis
- Prevent wrinkle formation & strengthen connective tissue
- High skin affinity and non-irritating to the skin
- Compatible with cosmetic ingredients
- Excellent chemical stability; also good for makeup

CORUM

C-Pep™ Defensyl

Palmitoyl Tetrapeptide-7

Skin strengthening peptide

Anti-inflammation
Inhibit IL-6 production

Anti-blue light
Inhibit inflammatory cytokines production
Restore collagen production

Clinical study
Anti-wrinkle

CORUM

C-Pep™ Defensyl

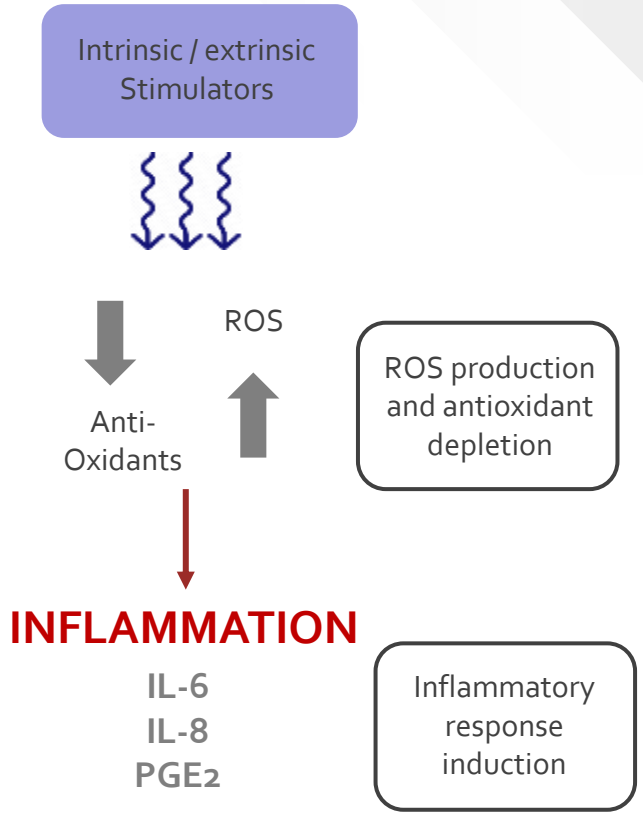
Palmitoyl Tetrapeptide-7

Properties:

- Anti-inflammation & anti-stress
- Strengthen skin defense system
- Prevent extrinsic damages from UV and blue light

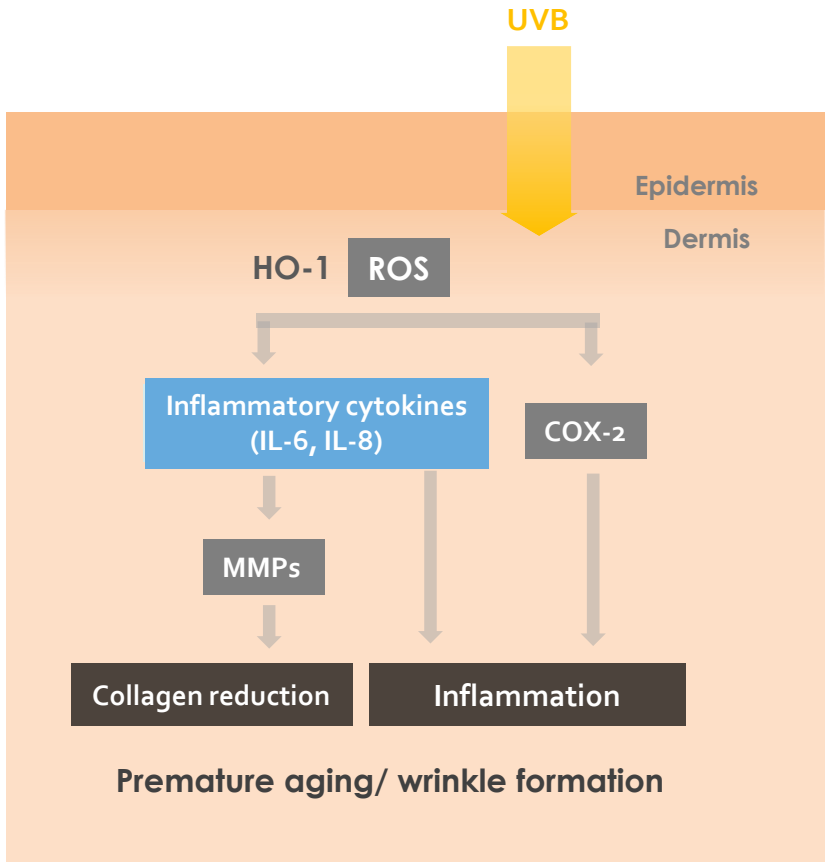
Mechanism:

Defensyl can mimic the activity of DHEA (Dehydroepiandrosterone) to suppress the production of excess interleukins to mature skin



Efficacy Study

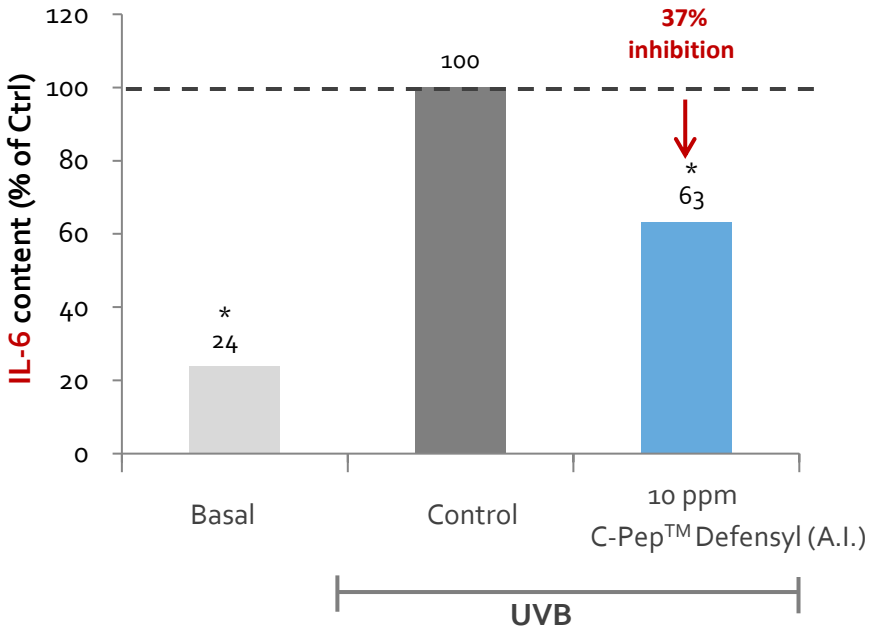
IL-6 inhibition



Gene level (qPCR)

*Cell Line: HaCaT

Anti-Inflammation Test – IL-6 Secretion

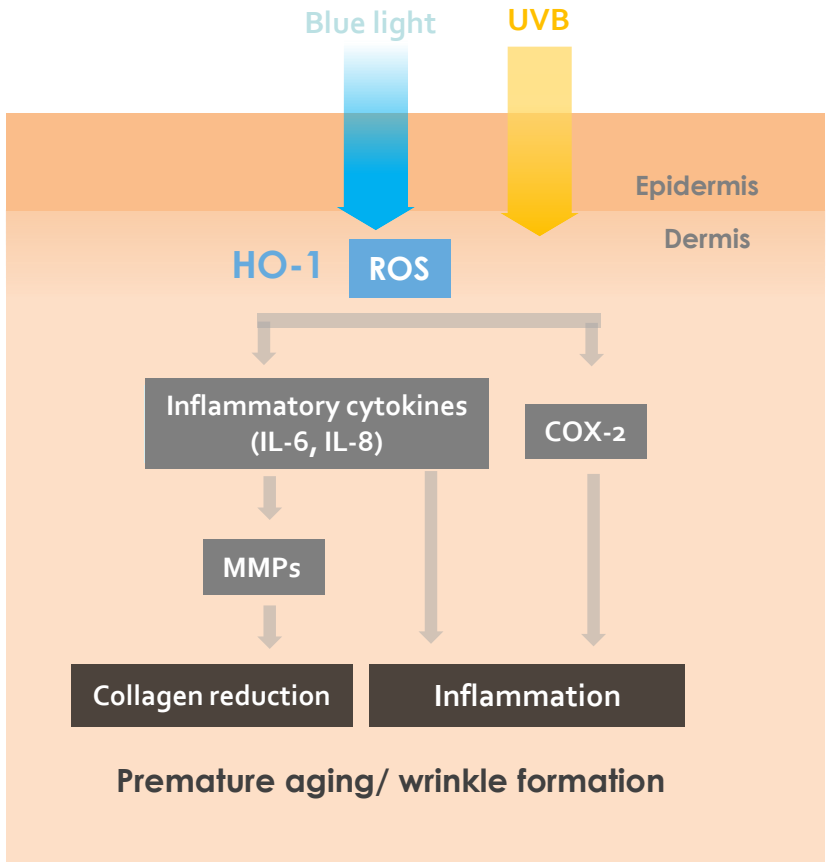


*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. Oct. 2018.

Efficacy Study

Anti-oxidant

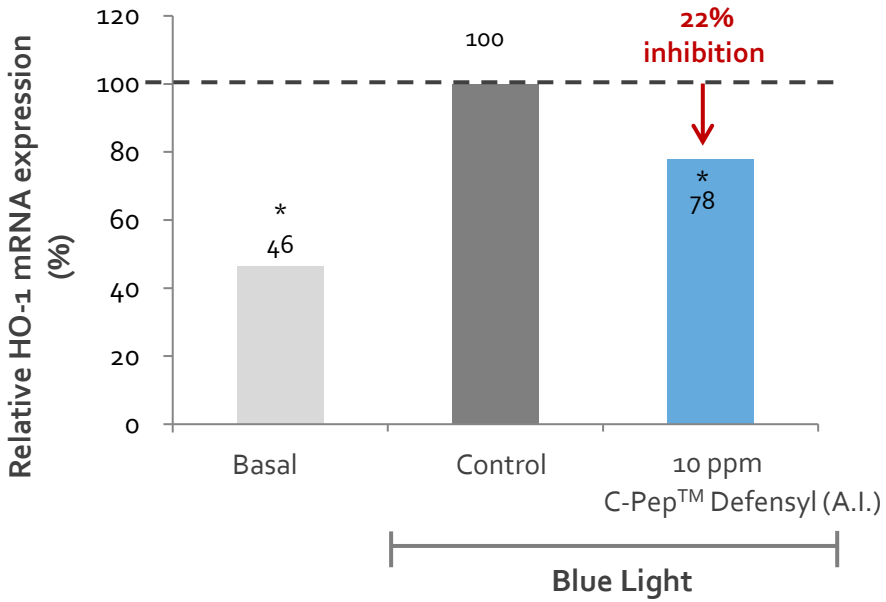


Gene level (qPCR)

*Cell Line: NHDF

Anti-Oxidation Effect
HO-1 (Heme oxygenase 1)

Heme oxygenase 1 (HO-1) is an inducible isoform in response to stress such as oxidative stress.

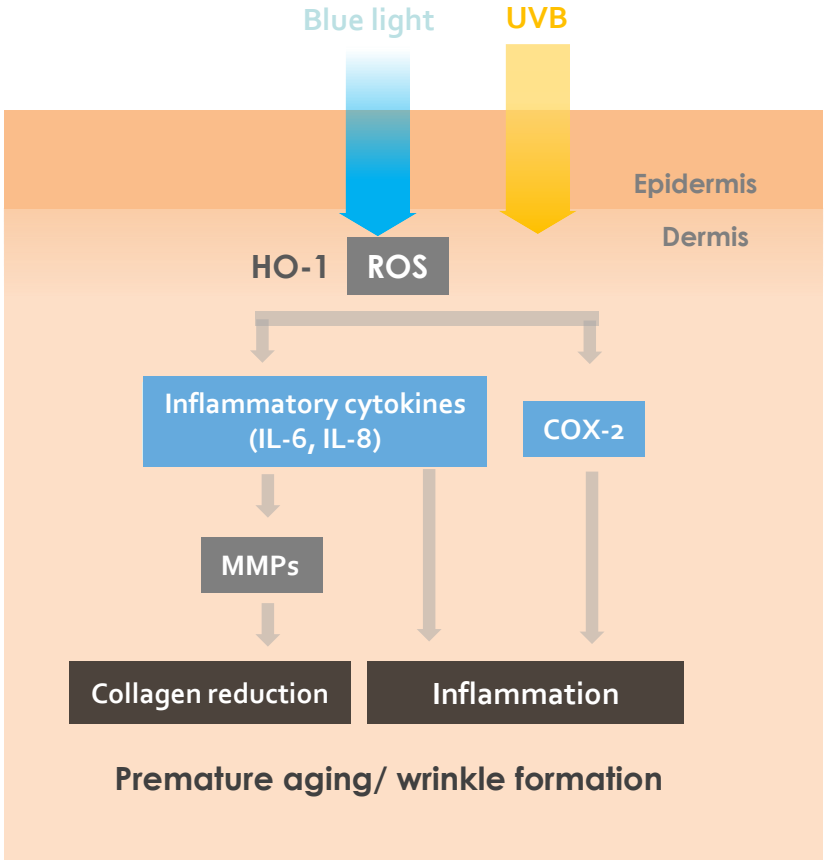


*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. May. 2018.

Efficacy Study

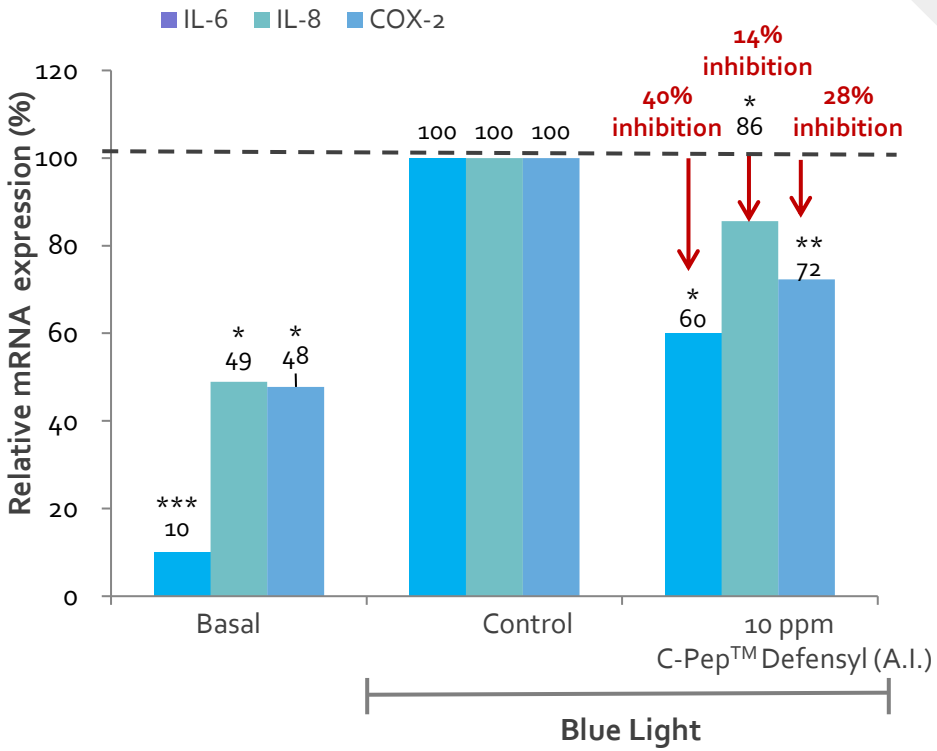
Anti-inflammation



Anti-Blue Light
IL-6, IL-8 and COX-2 Reduction

Gene level (qPCR)

*Cell Line: NHDF

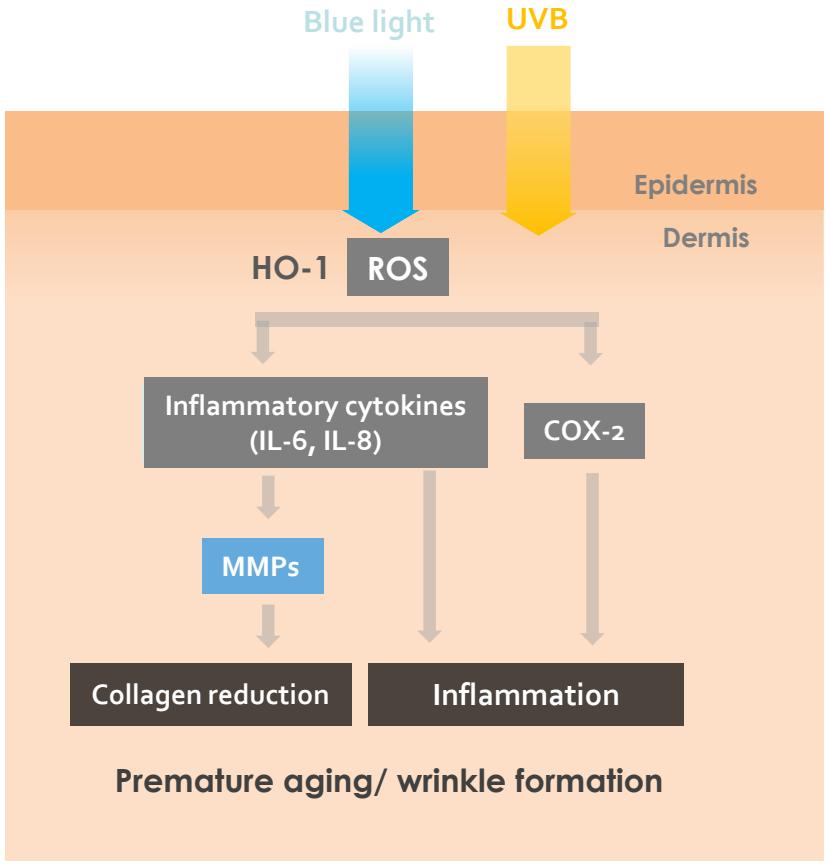


*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. May. 2018.

Efficacy Study

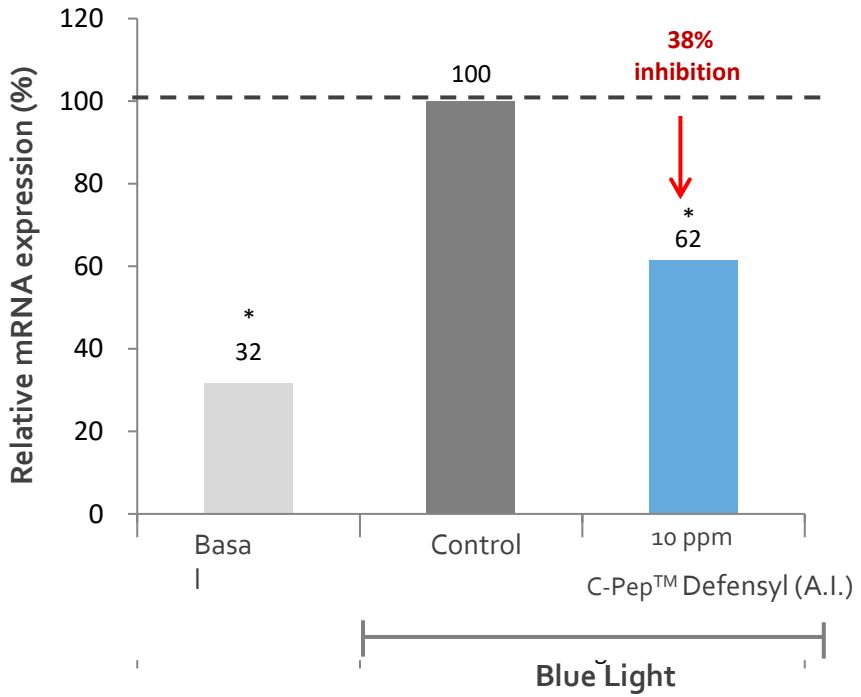
Restore collagen production



Anti-Blue Light
MMP-1 Reduction

Gene level (qPCR)

*Cell Line: NHDF



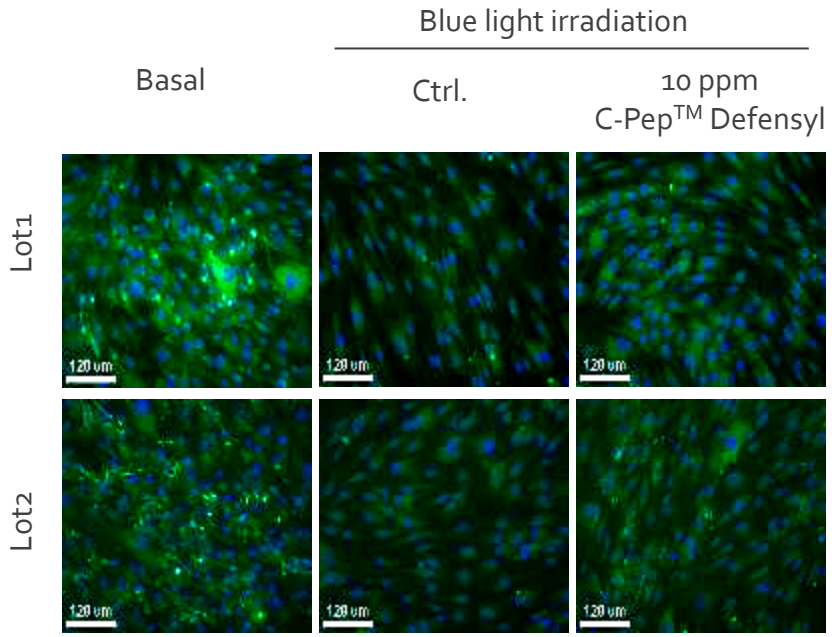
*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. May. 2018.

Efficacy Study

Restore collagen production

- Method : Immunofluorescence
- Cell : NHDF
- Time: pretreat C-Pep™ Defensyl for 1 day
- Stimulator: Blue light
- Test items: C-Pep™ Defensyl



*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. May. 2018.

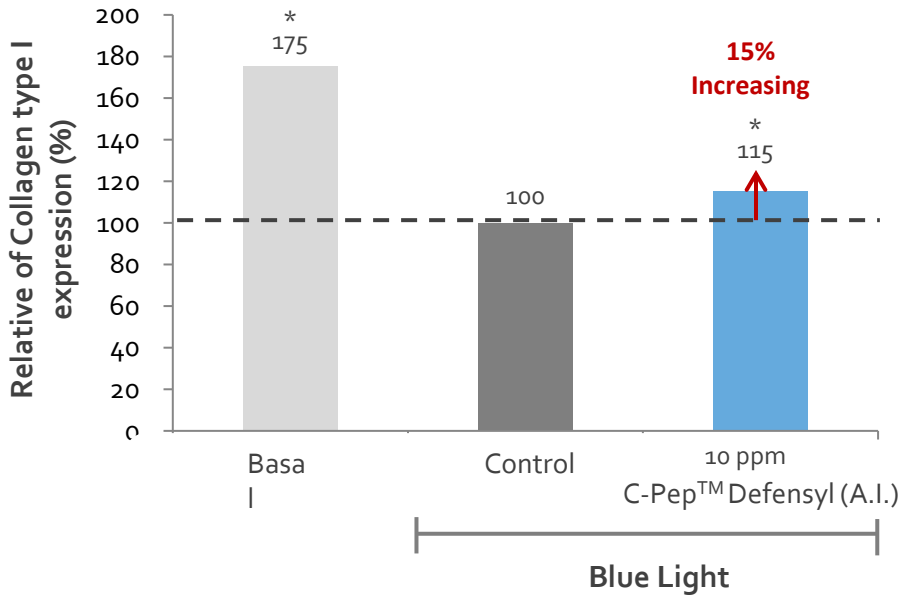
COL1A : Green
DAPI(nuclear): Blue

Collagen Production

The COL1A1 provides instructions for making part of a large molecule called type I collagen

Protein level (ELISA)

*Cell Line: NHDF
*Blue light wavelength: 440-460nm



Clinical Study

Anti-wrinkle

Anti-Aging *In-Vivo* Test

3% C-Pep™ **TriColl** + 1% C-Pep™ **Defensyl**

Objectives:

To evaluate the anti-wrinkle effect of peptide cream on the tested area.

by Laboratoire DERMSCAN, France

DermaScan Lab. May. 2006.

Clinical Study

Anti-wrinkle

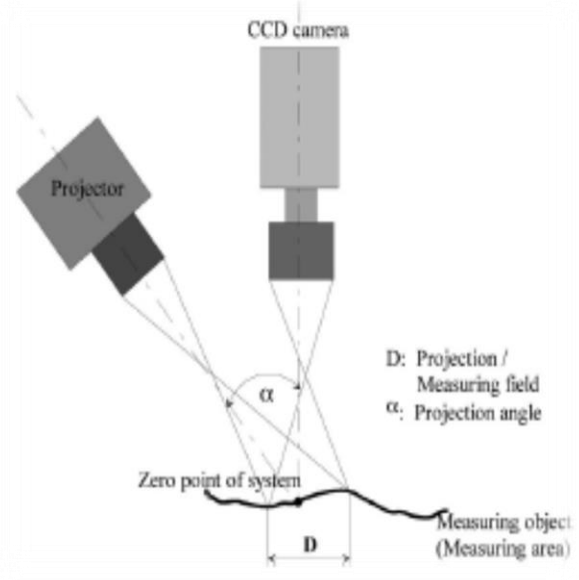
Anti-Aging *In-Vivo* Test

3% C-Pep™ **TriColl** + 1% C-Pep™ **Defensyl**

Anti-Wrinkle Efficiency Test

- Volunteers: 20 people
- Age: 53 ± 1 (40-64 years old)
- Test Duration: 28 days
- Test Area : crow's foot
- Test Method: Applied twice a day, day and night on test area (either right or left)
- Using Primos Compact to measure the parameter of wrinkle

Primos Compact



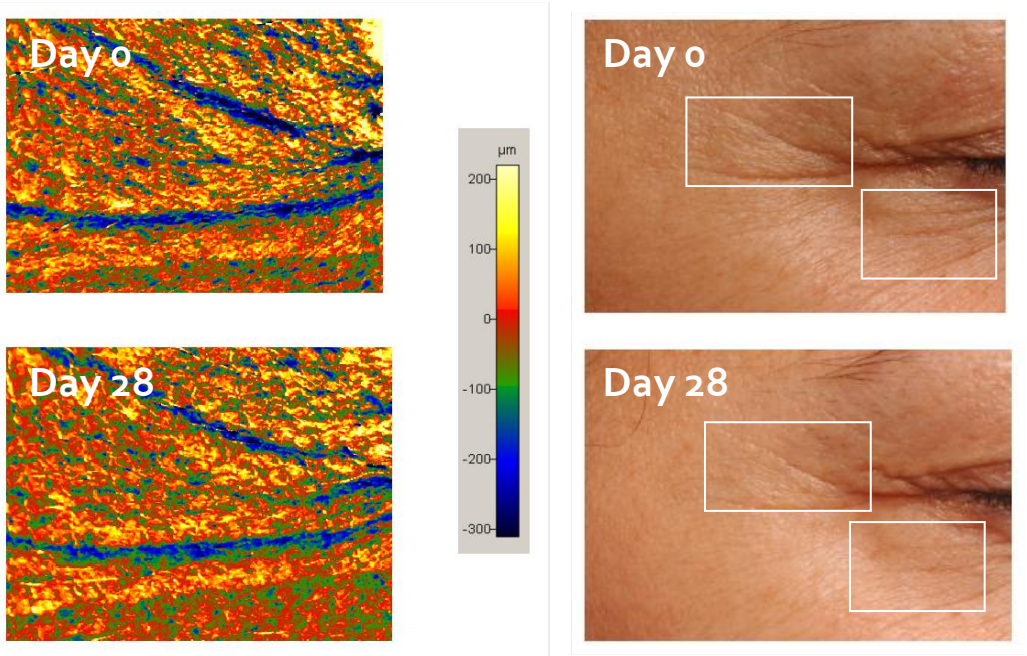
DermaScan Lab. May. 2006.

Clinical Study

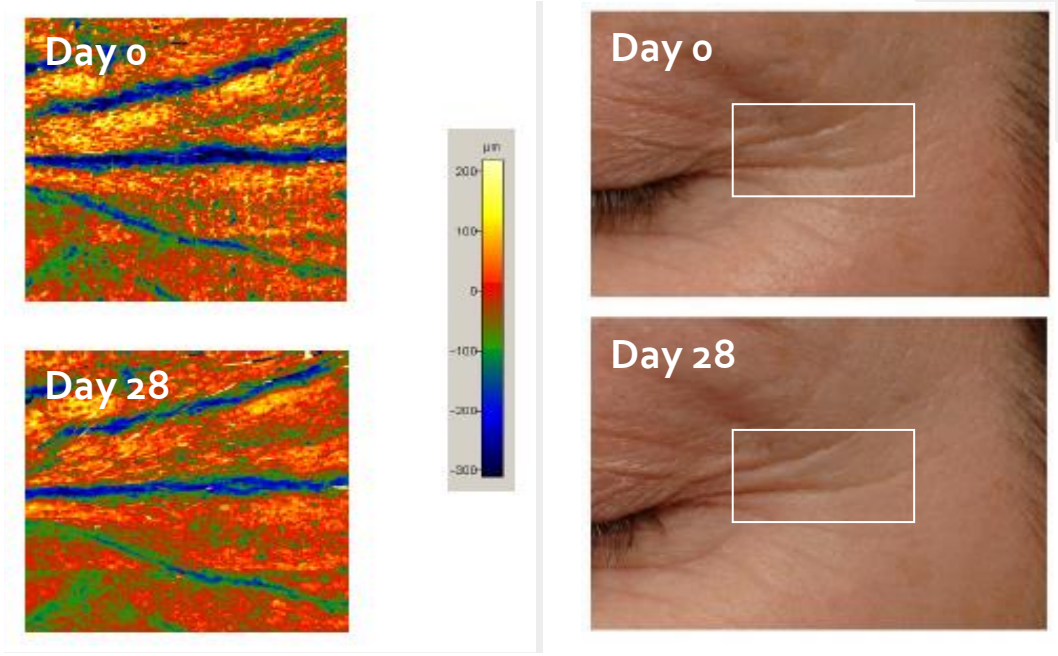
Anti-wrinkle

3% C-Pep™ **TriColl** + 1% C-Pep™ **Defensyl**

Subject 1



Subject 2



C-Pep™ Defensyl

Palmitoyl Tetrapeptide-7

Benefits:

- Protect skin from UV light and blue light
- Anti-photoaging and anti-wrinkle
- High skin affinity and non-irritating to the skin
- Compatible with cosmetic ingredients
- Excellent chemical stability

CORUM

C-Pep™ Elastyl

Palmitoyl Hexapeptide-12

Skin firming peptide

Anti-aging
Stimulate elastin production

Skin repair
Increase fibroblast production

Clinical study
Lip crest decreasing Effect
Skin firming effect

C-Pep™ Elastyl

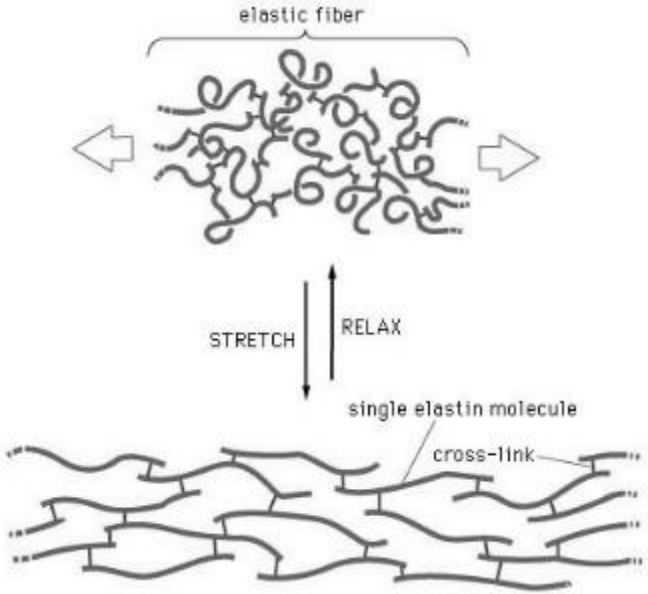
Palmitoyl Hexapeptide-12

Properties:

- Impart firming effect
- Reduce formation of wrinkles and fine lines
- Strengthen the natural barrier function of skin

Mechanism:

Elastyl is made up of repeated sequences of amino acids present in elastin, allowing it to signal the productions of fibroblast and natural elastin in human skin.



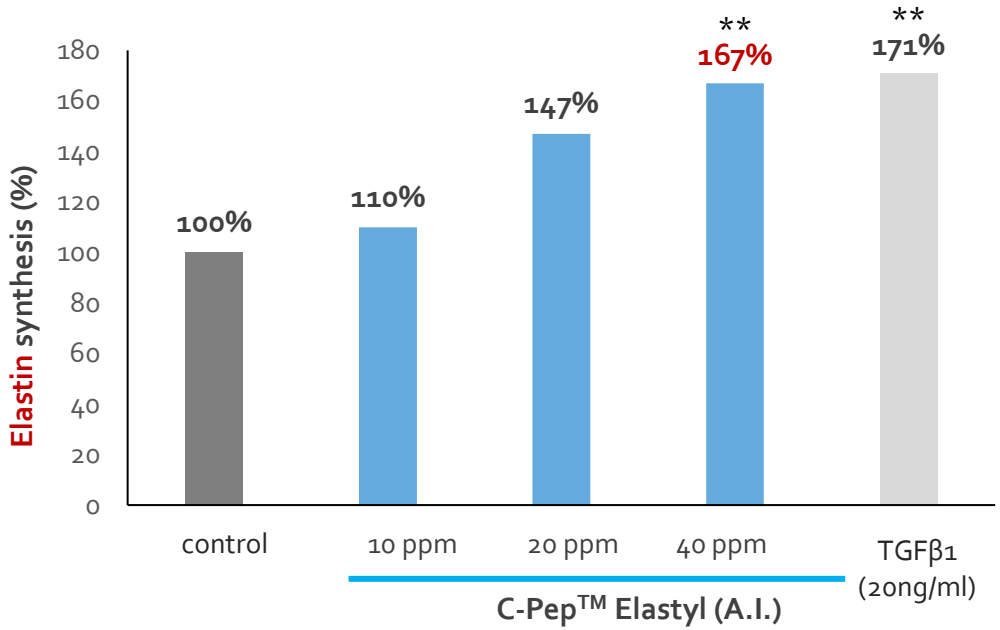
Efficacy Study

Stimulate elastin production

Protein level (ELISA)

*Cell Line: Fibroblast

Stimulation of Natural Elastin Synthesis



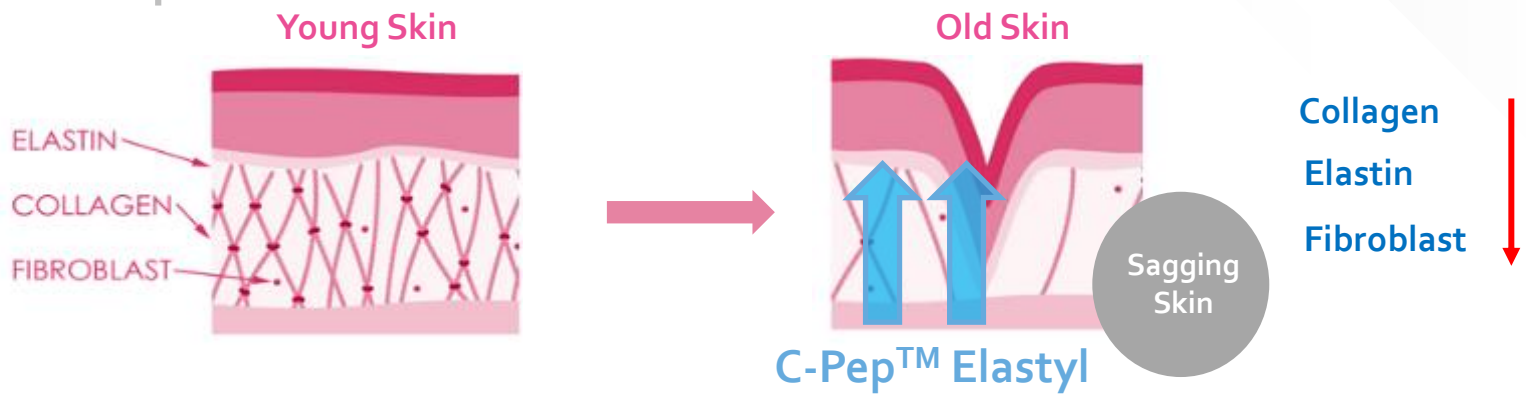
C-Pep™ Elastyl can stimulate elastin production up to 167% at 40 ppm and perform in a dose dependent manner.

*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. 2010.

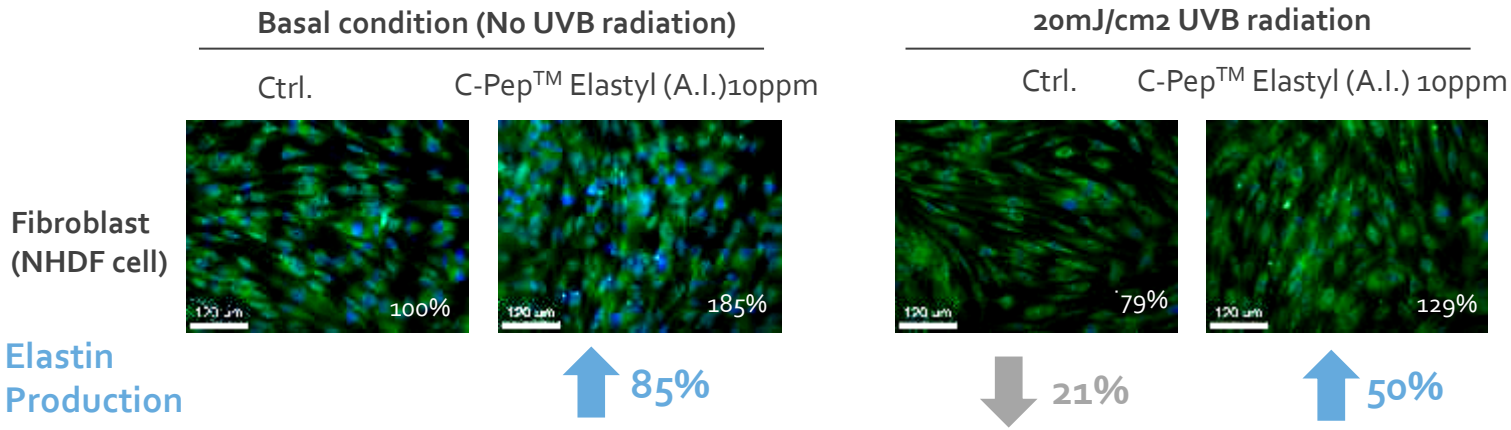
Efficacy Study

Stimulate elastin production



Protein level (Immunofluorescence)

*Cell Line: NHDF



C-Pep™ Elastyl stimulates elastin production before and after UVB radiation

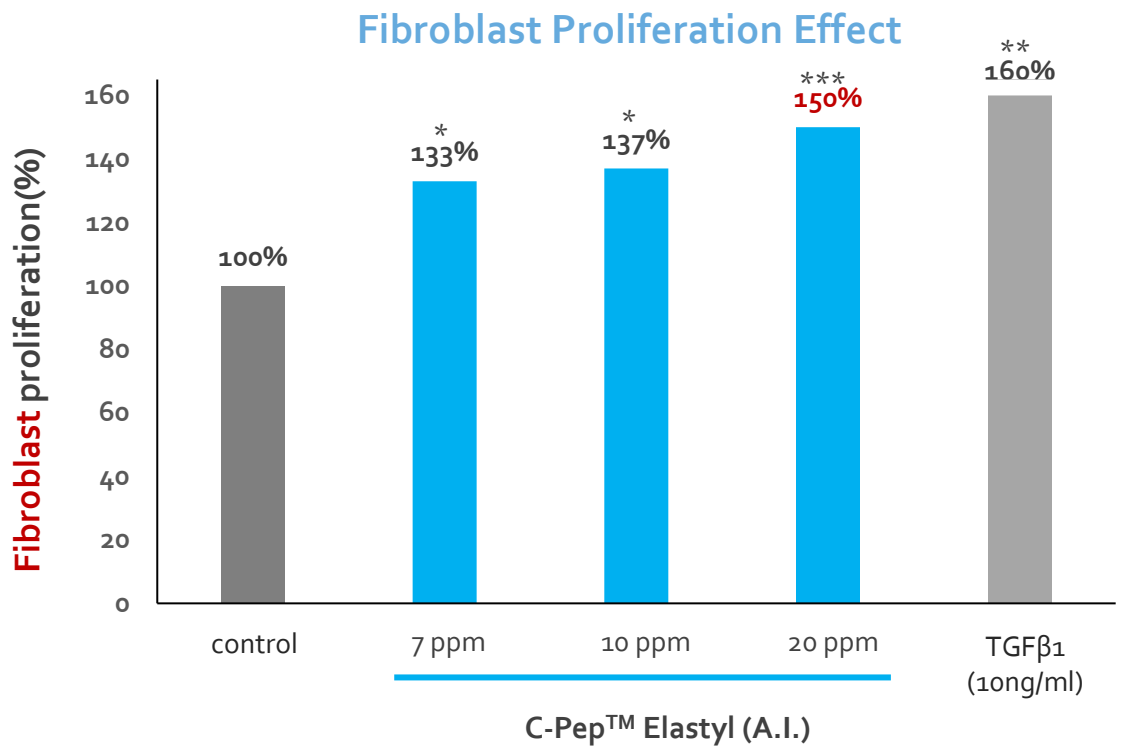
Corum R&D In-House Test. Sep. 2018.

Efficacy Study

Stimulate fibroblast proliferation

Cell Proliferation (MTT assay)

*Cell Line: Fibroblast



C-Pep™ Elastyl can stimulate fibroblast proliferation up to 150% at 20 ppm and perform in a dose dependent manner.

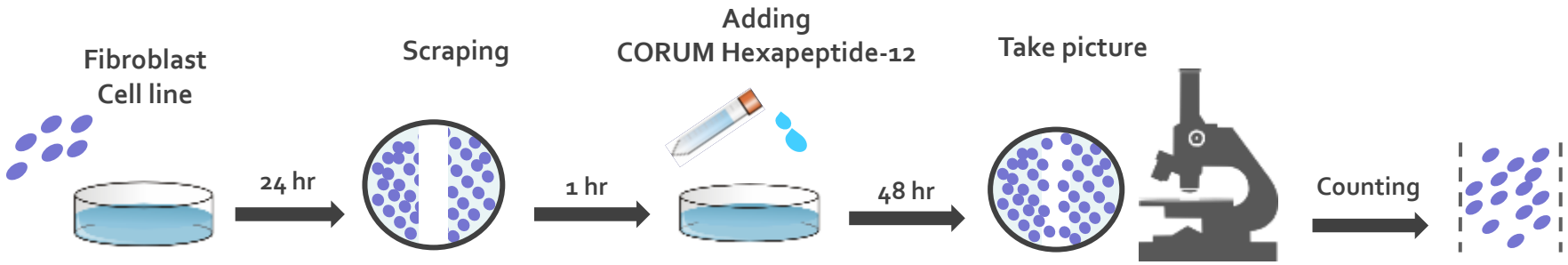
*p<0.05, **<p<0.01, ***p<0.001

Corum R&D In-House Test. Jun. 2009.

Efficacy Study

Cell migration

Migration Effect

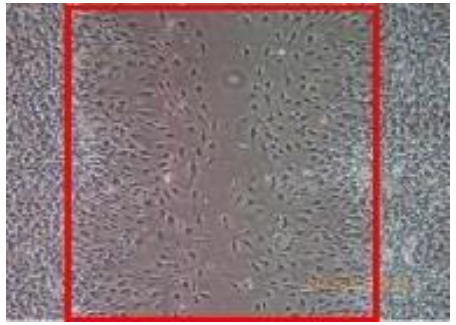


IDEA. Jun. 2006.

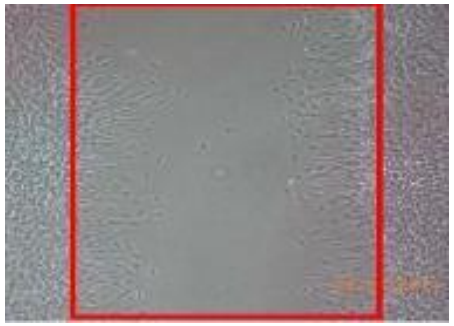
Efficacy Study

Cell migration

TGF β1 (10 ng/ml)

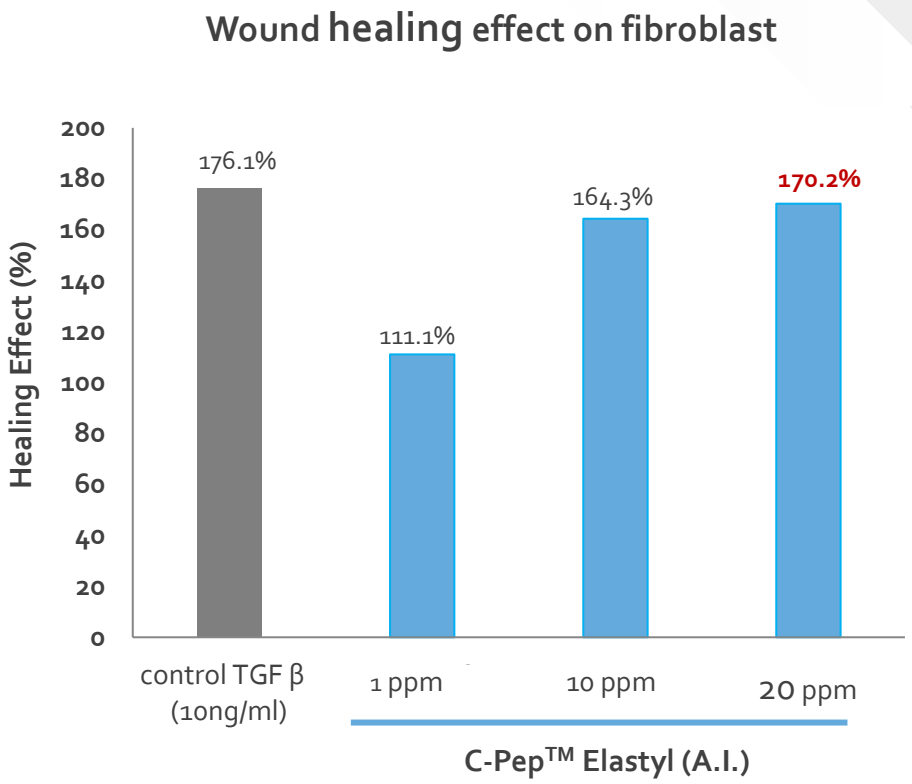


C-Pep™ Elastyl (1 ppm)



C-Pep™ Elastyl (10 ppm)

C-Pep™ Elastyl (20 ppm)



Cell Migration (MTT assay)

*Cell Line: Primary fibroblast

C-Pep™ Elastyl can stimulate fibroblast migration up to 170.2% at 20 ppm and perform in a dose dependent manner.

IDEA. Jun. 2006.

Clinical Study

Lip Crest Decreasing Effect

In-Vivo Lip Crest Decreasing Effect

■ Study conditions

Measurement kinetics	Do and D5
Measurement zone	Lip
Application method	Twice-daily application on the lip
Subjects	■ Number of subjects analysed: 15 ■ Sex: female ■ Age: between 21 and 50 years old

Objective：
To determine the effects on decreasing lip crests of C-Pep™ Elastyl CC.

Corum R&D In-House Test. Jul. 2009.

Clinical Study

Lip crest decreasing effect

In-Vivo Lip Crest Decreasing Effect

	Before	After
Placebo (Mineral oil)		
3% C-Pep™ Elastyl CC		
5% C-Pep™ Elastyl CC		

Clinical Study

Firming effect

In-Vivo Firming Effect

5.5% C-Pep™ Elastyl (cream)

■ **Study Conditions**

Measurement kinetics	Do and D28
Measurement zone	Face (temple)
Application method	At home: twice-daily application on the face under normal conditions of use
Subjects	■ Number of subjects analysed: 10 ■ Sex: female ■ Age: 46 (36 ~ 55 years old) ■ Main inclusion criteria: loose skin on the face
Analytical Instrument	Cycle of five deformations of the skin measured with the Cutometer®

■ Open and intra-individual study

■ Each subject was her own control: Treated Zone / Non-Treated Zone

DermaScan Lab. Aug. 2005.

Clinical Study

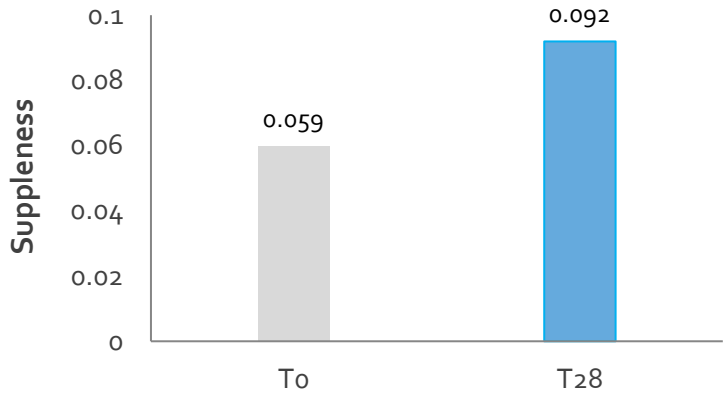
Firming effect

In-Vivo Firming Effect

5.5% C-Pep™ Elastyl (cream)

Suppleness

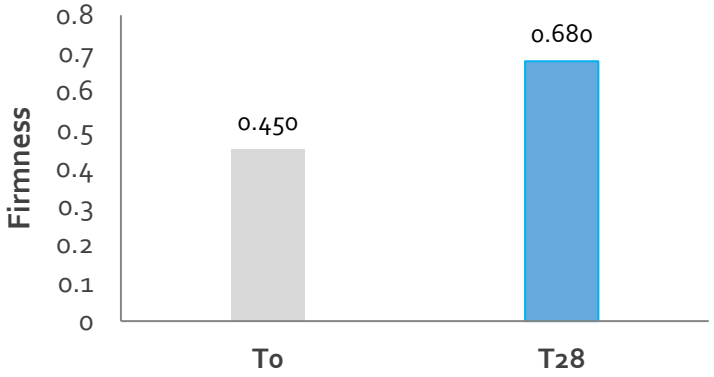
If the immediate extensibility increases, skin is suppler



Suppleness improves **57.6%**

Firmness

If the immediate retraction/total elongation ratio comes close to 1, skin is firmer



Firmness Improves **51.1%**

5.5% C-Pep™ Elastyl induced a significant firming effect in 90% of the volunteers and presented an excellent cutaneous tolerance

C-Pep™ Elastyl

Palmitoyl Hexapeptide-12

Benefits:

- Stimulate elastin product and fibroblast proliferation
- Skin firming and ant-aging
- High skin affinity and non-irritating to the skin
- Compatible with cosmetic ingredients
- Excellent chemical stability ; also good for lipstick

CORUM

Toxicological information

C-Pep™ series

■ **Skin irritancy by *IDEA***

5% C-Pep™ peptides on semi-occlusive 48-hours semi-occlusive patch method under dermatological control

All C-Pep™ peptides were found to be **non irritant** after 48-hours semi-occlusive patch test.

■ **Cytotoxicity test by *EVIC, France***

Cytotoxicity test on 6000 ppm C-Pep™ peptides diluted with 10% DMSO

All C-Pep™ peptides were found to be **negligible cytotoxicity**.

■ **Bacterial reverse mutation test by *Vivotecnia, Spain***

Assessment of mutagenic activity on *Salmonella Typhimurium* and *E. Coli*

All C-Pep™ peptides were found to be **non mutagenic** and **non pro-mutagenic**.

Reverse sign of aging

C-Pep™

Palmitoyl Peptides

Customize your anti-aging blend of **gentle, non-irritating, odorless** and **PEG-free** peptides

Anti-wrinkle	All C-Pep™ Peptides
Anti-ageing	All C-Pep™ Peptides
Skin protection	C-Pep™ Defensyl
Anti-stress	C-Pep™ Defensyl
Firming	C-Pep™ Elastyl
Anti-stretch mark	C-Pep™ Tricoll C-Pep™ Defensyl

***Regulatory status:**

China IECIC listed (C-Pep™ Nutecyl not included)

Halal approved

CORUM