Pure and Naturally Derived Meadowderm®:
Discover the Secret to Beautiful Skin
Imagine walking through a field of blooming white little flowers with a pleasant fresh sensation.

This is like wandering through a field of beautiful Meadowfoam Flowers (*Limnanthes alba*), our source for unique and high value cosmetic ingredients.
FANCOR® Meadowfoam Seed Oil

Seed

Crushing → Extraction

Liquid Extract

Refining

1. Meadowfoam Seed Oil

Modification

2. Meadowfoam Derivatives

Meal (Protein)

Silicones

Esters

Fatty Acid

Quats

Others
Meadowfoam Seed Oil - A source for unique ingredients

Meadowfoam Seed Oil

- unique molecular structure not found in any other naturally occurring substance
- high content of long-chain fatty acids
- offers extraordinary oxidative stability due to combination of lack of conjugated double bonds and its natural antioxidants
Meadowderm®, the unique naturally derived active ingredient, provides measurable and meaningful anti-aging benefits

(INCI: Meadowfoam Delta-Lactone)
Meadowderm® –
Healthy and beautiful skin – how?

Studies conducted to prove the anti-aging benefits

• *In-vitro* studies targeting key genetic markers, demonstrate the bioactivity to improve the level of relevant key proteins inside the skin for youthfulness

• *In-vivo* data show significant improvements in skin texture, total wrinkle surface area and appearance in close-up images and silicone replica images
In-vitro

Gene Expression Analysis of Full-Thickness Skin Cultures
Gene Expression -
Biological Processes and Skin Appearance

Changes in skin appearance caused by complex physiological and biological processes:

**Phenotype**

- Extracellular matrix integrity, anti-oxidant production, aging, DNA repair, hydration

Day 0

Day 90

Wrinkles, pores size, age spots, gray tone, ...

**Changes in Processes**

**Genotype**

Changes in gene expression of Metalloproteinases, collagens, sirtuins, growth factors, enzymes, ...
The Extracellular Matrix (ECM) is the non-cellular component present within all tissues and organs. It provides structure and biochemical support to the surrounding cells.

- The ECM provides essential physical scaffolding for cells
- It is composed of water, proteins, polysaccharides and other tissue-specific components
  - Collagen: most abundant protein in the ECM
- It is required for tissue morphogenesis and differentiation
Meadowderm® increases expression of relevant ECM markers

- **FMOD**: Fibromodulin
- **LUM**: Lumican
- **DCN**: Decorin
- **TGFB1**: Transforming growth factor-β
- **TIMP2**: Tissue inhibitor of metalloprotease 2
- **COL4A2**: Collagen 4A2

Meadowderm® treated samples demonstrate an increase in the expression of relevant components of the extracellular matrix.
ECM markers –
Family of Proteoglycans

- **Proteoglycans**
  - Fibromodulin (FMOD), Decorin (DCN) and Lumican (LUM)
  - Major components of the ECM
  - Large ECM stabilising complexes together with other proteoglycans, hyaluronan and fibrous matrix proteins like collagen
  - Assembly of collagen fibers
  - Positive impact on hydration level due to net negative charge and attraction of Na$^+$ ions, which attract water molecules
  - During aging structural differences and lower protein content of proteoglycans are known
ECM markers –
Other main structural proteins

• **Transforming Growth Factor (TGFB1)**
  • Known for stimulation of collagen synthesis
  • Aged skin expresses less TGFB1, therefore less collagen synthesis foreseen

• **Tissue Inhibitor of metalloprotease 2 (TIMP2)**
  • Natural inhibitors of MMP’s, therefore less degradation of extracellular matrix proteins like collagen
  • Maintenance of tissue homeostasis of suppression of proliferation

• **Collagen 4A2 (COL4A2)**
  • Major structural component of basement membrane
    • Between dermis and epidermis
  • Network collagen type

**Structural proteins of ECM are upregulated**
Meadowderm® actively contributes to Anti-Aging processes

Interaction of Relevant Markers for ECM Breakdown and Anti-Aging

SIRT1

MMP-9

-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0

Control 2% Meadowderm®

- Sirt 1: Sirtuin 1
- MMP-9: matrix metallo-proteinase 9

Meadowderm® treated samples show an increased Sirt 1 expression and a decreased MMP-9 expression.
Meadowderm® prevents skin cells from oxidative stress

Increase in Anti-Oxidant Response

- **(MT2A)**: Metallothionein isoform 2A
- **(SOD2)**: Superoxide dismutase 2

Meadowderm® treated samples show an increase in the expression of relevant proteins protecting the cell structures from oxidative stress.
Important markers of cellular Anti-Oxidant Response

Meadowderm® treated samples show an increase in the expression of relevant proteins protecting the cell structures from oxidative stress

- Oxidative stress
  - Reactive Oxygen Species (ROS) are natural byproducts of metabolism and can contribute to aging

- Metallothionein isoform 2A (MT2A)\(^1\) inhibits ROS- (reactive oxygen species) mediated cell death
  - MT2A has a protective role against oxidative stress

- Superoxide dismutase 2 (SOD2)\(^2,3\) is the main anti-oxidant enzyme that scavenges ROS
  - Acts as a first line of defense against oxidative damage
Meadowderm® as skin hydrator to prevent aging

GBA: Glucosidase, beta acid
HAS2: Hyaluronan synthase

Meadowderm® treated samples lead to increased expression of Hyaluronan synthase 2 and Glucosidase, beta acid.
Key markers for water retention in the skin

Meadowderm® treated samples lead to increased expression of Hyaluronan synthase 2 (HAS2)

- HAS2 is responsible for hyaluronic acid (HA) synthesis in the skin\(^\text{10}\)
- HA is a key component for water retention in the human skin\(^\text{11}\)

Meadowderm® showed an increase in Glucosidase, beta acid (GBA)

- GBA is an enzyme responsible for the formation of epidermal ceramides, the main lipid components in cell membranes exhibiting good water binding capacities\(^\text{12}\)
- With aging a decline of ceramides is known
In-vivo

Three months efficacy testing on facial skin

Half-face design
Project description skin study (1/2)

- **Volunteers**
  - **12 participants**
    - Age 35-68, mean age 45
    - 5 participants between 45-50 years
    - 5 male, 7 female participants

- **Half face design**
  - One face side treated with active, the other without active

- **Single-blind experimental set-up**
  - Participants do not know which face side is treated with the active
  - Information was revealed after study was closed
Application
- Twice a day with a specified volume of the creams
- For 3 months

Discontinuation
- No other anti-aging treatments were allowed to be used during the study
  - anti-aging actives in cosmetic formulations forbidden
- Normal skin regime was allowed
  - decorative cosmetics, sun care without claiming anti-aging, shaving and after-shave products, skin cleaning products

Measurement room
- All measurements and tests were conducted in a temperature controlled room (21°C +/- 1°C)
Experimental set-up

- Skin evaluation with different scientific devices:
  - Valuable data by
    - VisioFace® RD
      - high resolution standardized full face photography
    - Visioline® VL 650/Quantirides
      - Skin macro relief by silicone replica and oblique lighting
  - Parameters analyzed:
    - Total Wrinkle surface
    - Wrinkle length
    - Form Factor
    - Wrinkle Depth
    - Total Number of Wrinkles
- R – side with 2% Meadowderm®  ▪  L – side without active
Average of Total Wrinkle Surface Area over time

Initial Total Wrinkle Surface Area reading is taken as base

Differences are given in percentage
Visible reduction of crow’s feet for side with active Meadowderm®

Participant stated a recognizable difference for side with active, not for side without.
Silicon replicas show reduced wrinkle depth with Meadowderm®

Visible changes in the silicone replicas
No visible improvement for side without active

VisioFace® RD photography

- The side without active did not show any positive change
No changes on silicone replicas for side without active

Day 0

Day 90

✔ No visible changes on skin replicas for the side without active
The marked crow feet wrinkle area was selected for a zoom in.
The sections are given in the silicone replica image as **red coloured square.**
3D image of selected wrinkle areas

T1
Initial reading on side before applying any active

T2
After 1 month of using active

T3
After 6 weeks of using active

T4
After 2 months of using active

Visible reduction of wrinkle depth (shown in dark blue) with Meadowderm®
One section of one crow feet wrinkle was selected for the side treated with the placebo cream without Meadowderm®. The sections are given in the silicone replica image as **blue coloured square**.
3D image of selected wrinkle areas

T1
Initial reading on side before applying any active

T2
After 1 month of using active

T3
After 6 weeks of using active

T5
After 3 months of using active

Side without active!

✓ No improvement of wrinkle depth (shown in dark blue) without active
Meadowderm® - Summary

- Unique functionally active ingredient for the effective treatment of skin

- *In Vitro* skin biomarker analysis led to distinct changes in expression of relevant genes upon treatment with Meadowderm®

- *In Vivo* skin data confirm the anti-aging effect in reduction of total wrinkle surface area, which can also be seen by eye and in silicone replicas

- Data suggest that Meadowderm® exhibits powerful anti-aging characteristics and actively contributes to the health and beauty of our skin
List of literature references on gene expression results

- **All our results are in line with published data**


Thank you very much!

For further questions please contact consumer@elementis.com

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