

SKIN & HAIR CARE BROCHURE

BETAINE  
**GENENCARE® OSMS BA**  
THE MOISTURIZING  
OSMOLYTE



**iff**

Osmolytes are nature's secret to managing water balance within living cells, by attracting and holding on to vital moisture. IFF has harnessed this hidden power to create GENENCARE® OSMS BA, a naturally-sourced osmolyte for personal care. GENENCARE® OSMS BA is part of our natural, upcycled GENENCARE® active range.

|    |  |    |
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# THE MOISTURIZING OSMOLYTE



GENENCARE® OSMS BA is highly purified anhydrous betaine, extracted from sugar beet and upcycled from a sugar production side stream. Betaine is an osmolyte and amino acid derivative that is 100% bio-based and occurs naturally in plants, animals and our skin to protect them from hydric stress. It is easy to formulate in skin care, hair care, toiletries and make-up.

## BENEFITS OVERVIEW

### Skin care

GENENCARE® OSMS BA is an osmoprotectant, which helps protect proteins and balance water in skin. It contributes to:



Moisturization

- **Osmosis**  
Protect keratinocytes from dehydration. Keratinocytes synthesize specific osmolyte transporters on their membrane to increase betaine uptake and allow cell rehydration (*in-vitro test*).



Protection

- **Strengthen the skin barrier**
  - Reinforces the Tight Junctions in the stratum corneum (*in-vitro test*).
  - Reduces Trans-Epidermal Water Loss (4-week clinical study, 40 volunteers).



Sensory

- **Improve the sensory profile** of formulations. Reduced stickiness and oily feeling, improved spreadability, and silky after-feel. (*Sensory evaluation of hand sanitizers by an expert panel*).

### Toiletries



- **Protect proteins** against denaturation by surfactants (*in-vitro zein test*).
- **Mitigate surfactant** irritation (*Clinical patch test*)
- **Improve foam volume**, sensory and stability.

### Hair care

Betaine has a strong affinity with keratin and can deeply penetrate the hair cortex as well as deposit on the hair surface by binding to damaged sites. It contributes to:



Hair strengthening

- **Strengthen hair and reduce broken fibers and split ends** (*instrumental tests*).



Hair conditioning

- **Improve wet and dry combing** (*instrumental tests*).



Frizz control

- **Reduce frizz** in humid environment (*instrumental tests*).



Scalp protection

- **Improve scalp barrier integrity** with a significant reduction of the Trans Epidermal Water Loss over a 5-week in-use test (*clinical study, 39 volunteers*).



Suitable for sensitive skin





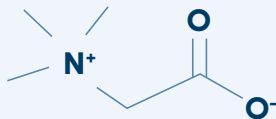
Suitable for intimate care





# GENENCARE® OSMS BA BETAINE ORIGIN STORY

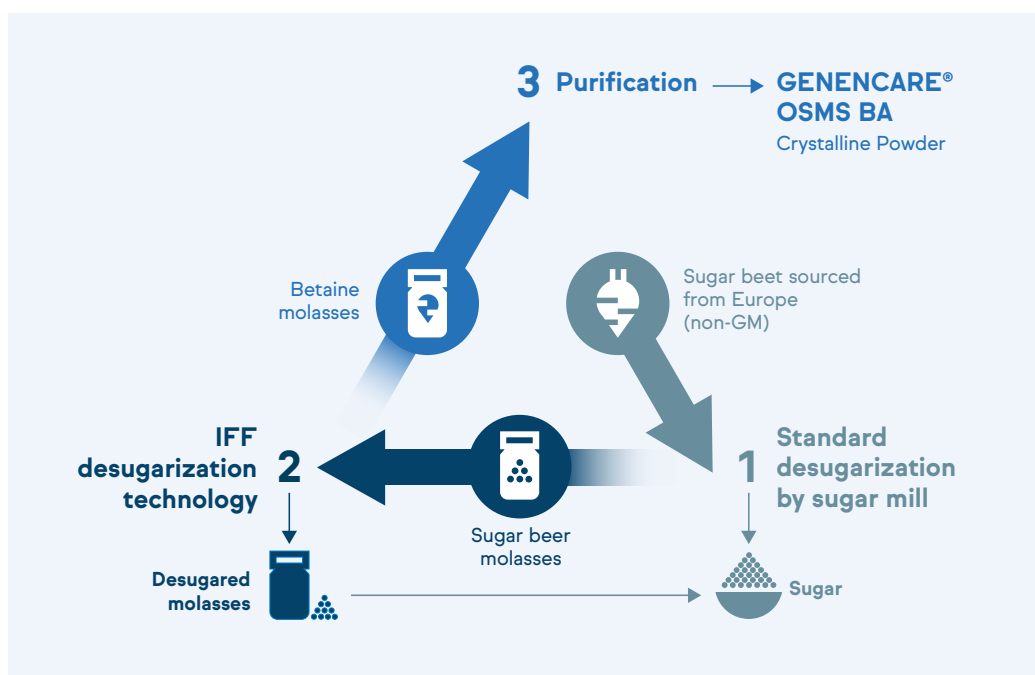
Sugar beets grow best in a sandy loam soil. As descendants of coastal plants, they tolerate salty soils and drought. They accumulate betaine in response to drought stress, as a characteristic of the family Chenopodiaceae. Sugar beets are cultivated for their high content of sugar, and the byproducts of the sugar production are the pulp, which is made of insoluble fibers; and the molasses, which are rich in betaine.

|  |  |  |
|--|--|--|
|  |  |  |
| Sugar Beet ( <i>Beta vulgaris</i> )  | Beet root cells  | Betaine (Trimethylglycine)   |

- Sugar beet root (*Beta vulgaris*)
- 100 % natural from non-GM plants
- Beet sourcing from Europe
- Produced in Finland

## An upcycled ingredient

GENENCARE® OSMS BA is upcycled from a sugar production side stream using innovative IFF technology. It is made of 99% Upcycled uniform diverted (from side stream) inputs by weight.



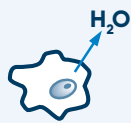
GENENCARE® OSMS BA is Upcycled Certified™ by the Upcycled Food Association

# THE SCIENCE OF OSMOLYTES

Osmolytes are small organic molecules involved in osmosis. They occur naturally in the cells of living organisms.

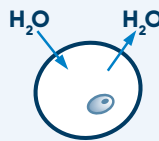
## Osmosis and cell tonicity

Osmosis is the process by which molecules of solvent pass through a semi-permeable membrane from a less concentrated solution into a more concentrated one, equalizing concentrations on each side of the membrane. This is the driving force by which water is transported in living cells.



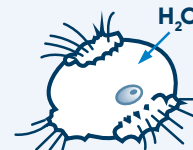
### Dry or hypertonic environment

**Water leakage**  
Cell increases osmolytes intake to retain water and re-inflate the cell.



### Normal isotonic environment

**Water balance**  
No solute exchange needed.

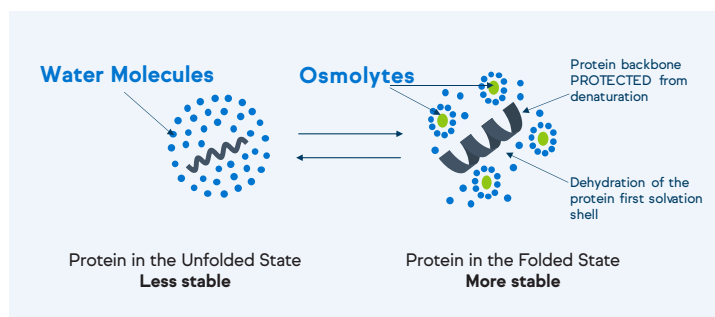


### Hypotonic environment (pure water)

**Water intake**  
Cells release osmolytes to get the water out.

## Protein protection

Osmolytes protect protein from denaturation. Osmoprotection is an indirect mechanism by which osmolytes attract water away from the protein core, allowing them to fold into their stable 3D conformation.



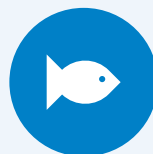
## Osmoprotection: The role of osmolytes in Nature

Osmolytes are molecules with the ability to manage water balance in living cells.



### Plants

Plants use osmolytes in dry environments. They load their cells with organic osmolytes in order to increase water retention within the cells.



### Marine animals

Use osmolytes to match the osmolarity of the surroundings and to counteract the effect of hydrostatic pressure.



### Mammals

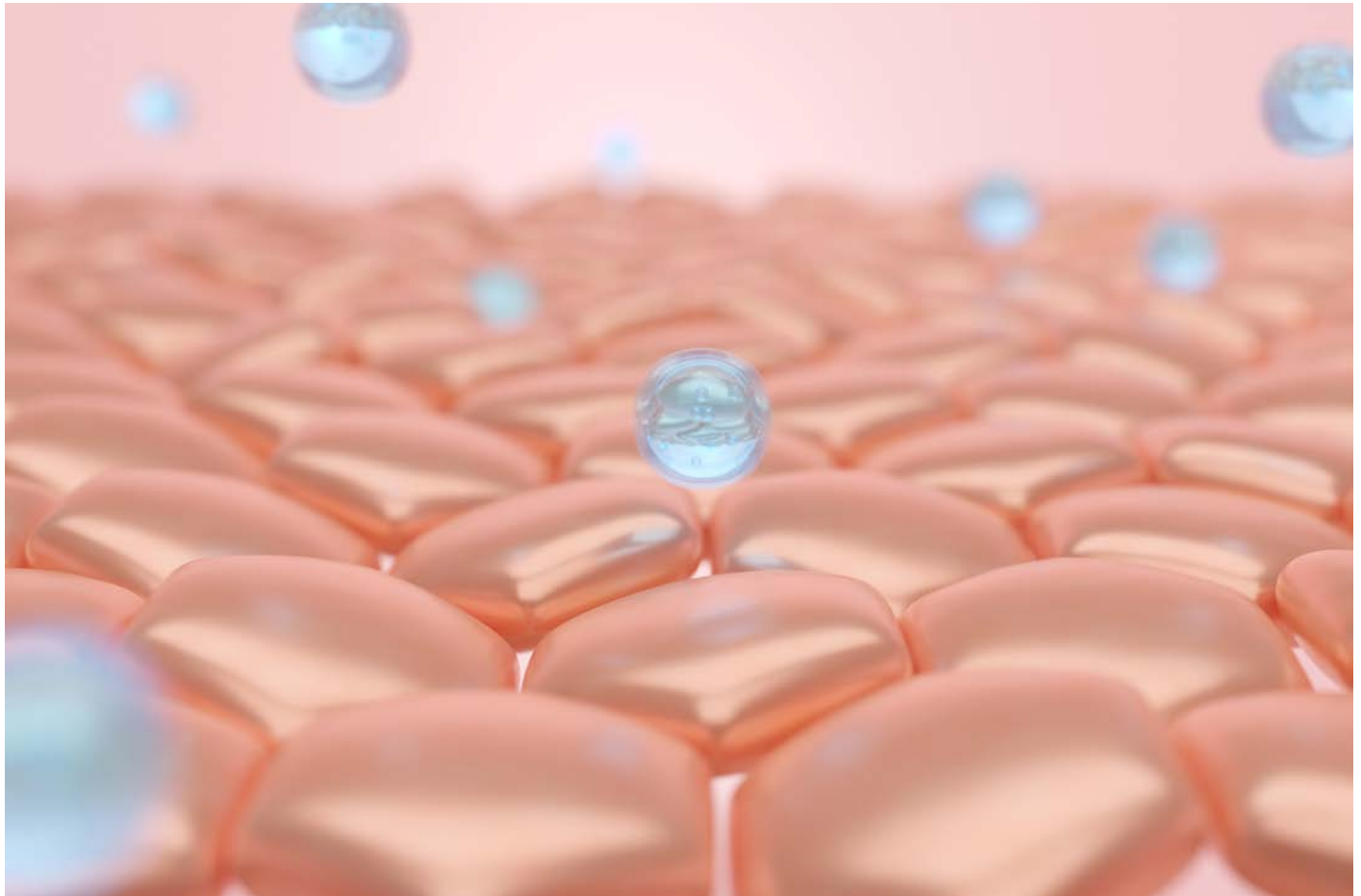
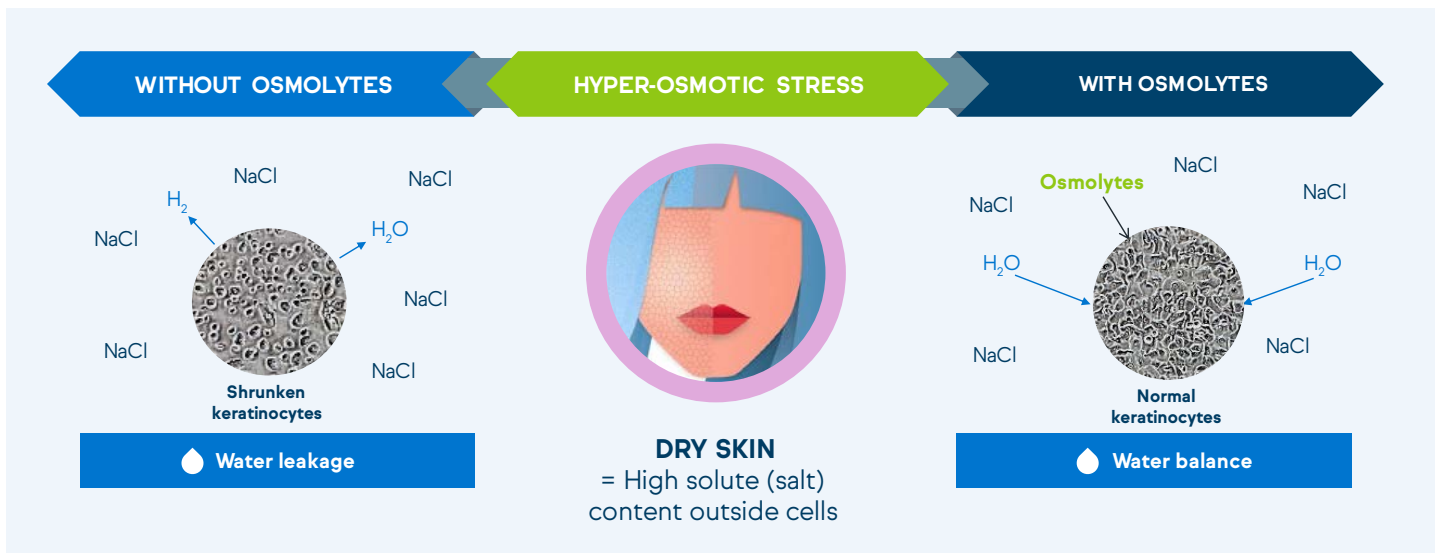
Osmolytes are found in high concentration in the kidneys of many mammals<sup>1</sup>. They help balance the blood osmolarity.

<sup>1</sup> 2004, 2007, 2008 Warskulat D. and al.

# THE SCIENCE OF OSMOLYTES

## Osmoprotection : The role of osmolytes in the skin

In the skin, osmolytes protect keratinocytes from hyperosmotic stress. Osmolytes are involved in keratinocytes' strategy to survive environmental stress<sup>1</sup>. Under oxidative (UV) or thermal stress, keratinocytes synthesize specific osmolyte transporters on the membrane (BGT-1) for an active intake of betaine, leading to an increased water intake and cell volume recovery.



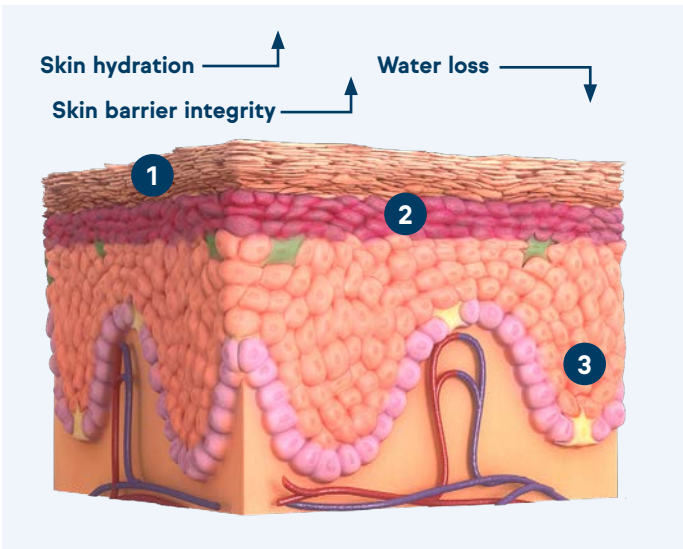
<sup>1</sup> 2004, 2007, 2008 Warskulat D. and al.

# SKIN CARE





# GENENCARE® OSMS BA BETAINE MODE OF ACTION



## 1 Stratum Corneum hydration

- As a humectant, betaine captures water molecules on the surface.
- Betaine is naturally present in the stratum corneum.

## 2 Skin barrier strengthening

- Betaine makes the Tight Junctions between keratinocytes stronger; increasing skin barrier integrity and cohesion to limit water loss.

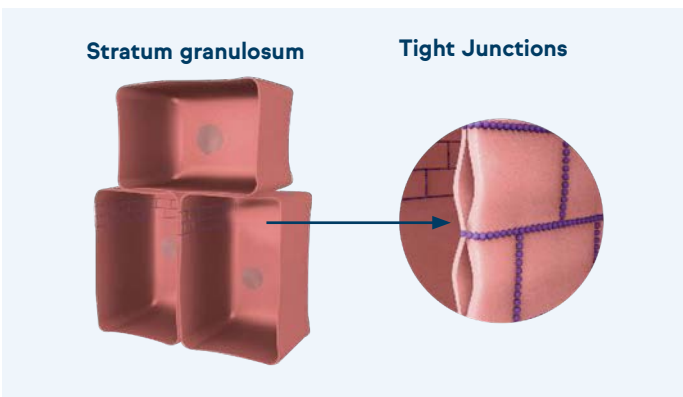
## 3 Osmoprotection

- Osmolyte strategy. Keratinocytes are protected from dehydration<sup>1</sup>.
- Helps to manage water balance and protect proteins.

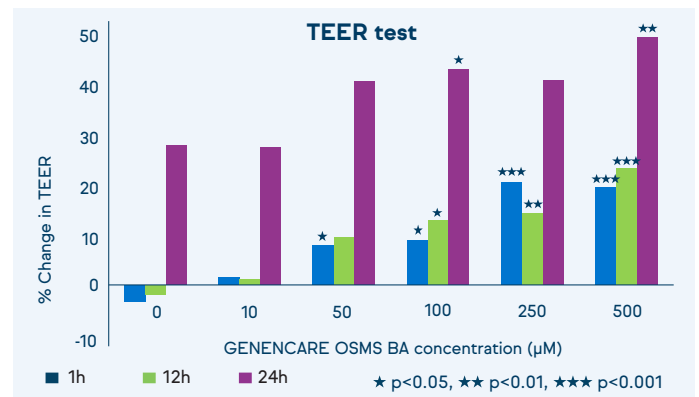
## Skin barrier strengthening

### Evaluation of Tight Junctions' integrity

Measurement of the Trans Epithelial Electrical Resistance (TEER)



GENENCARE® OSMS BA strengthens keratinocytes Tight Junctions, an indicator of an improved skin barrier integrity.



## Osmoprotection

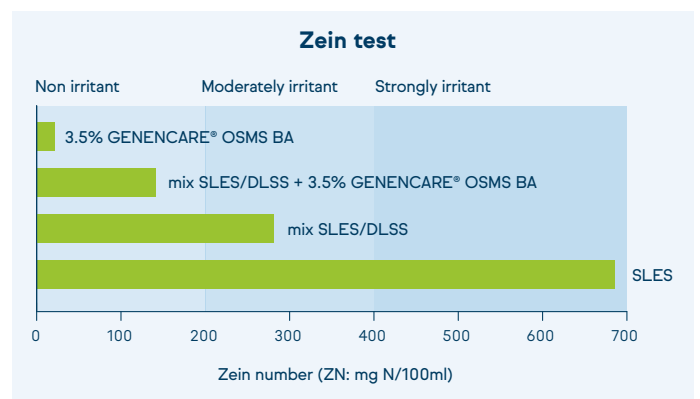
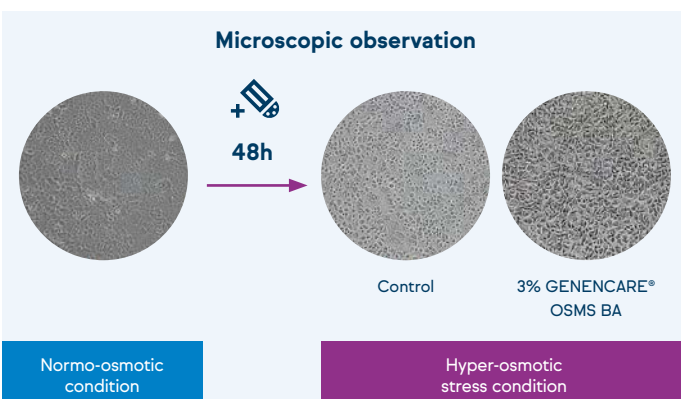
### Evaluation of keratinocytes' strategy to survive hyperosmotic stress.

3% GENENCARE® OSMS BA protects keratinocytes from hyperosmotic stress.

## Protein protection

### Evaluation of the protective effect against protein damage and surfactant irritation.

3.5 % GENENCARE® OSMS BA mitigates surfactant irritation and reduces the dissolution of the Zein proteins.





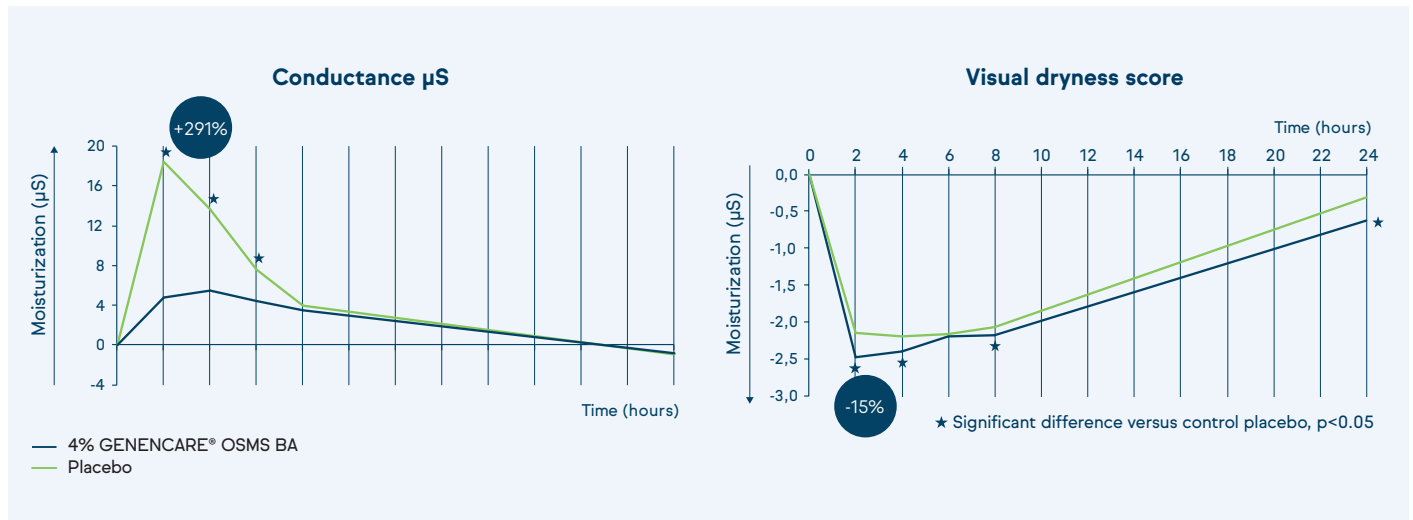
# GENENCARE® OSMS BA BETAINÉ CLINICAL TESTS



## 24h moisturization study

21 volunteers with dry skin

GENENCARE® OSMS BA improves skin conductance and reduces visual dryness at 2h, 4h, 8h and 24h. It contributes to improve skin moisturization over 24 hours after a single application.



# GENENCARE® OSMS BA BETAINE CLINICAL TESTS

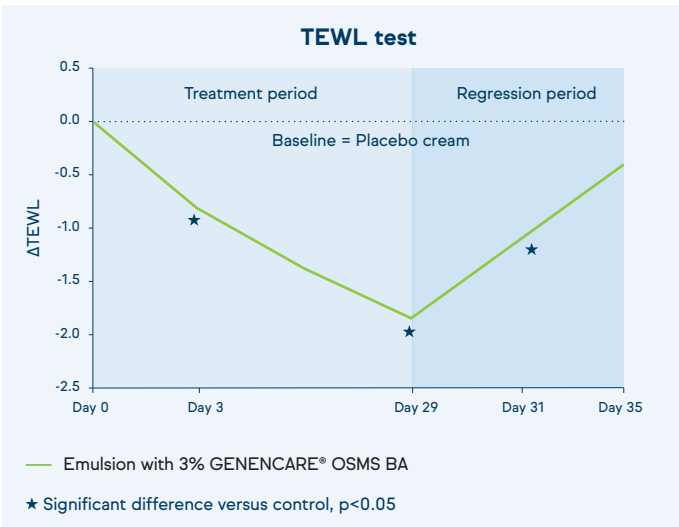


## 4-week moisturization study

41 volunteers, TEWL measurement

### Evolution of the TEWL over four weeks

GENENCARE® OSMS BA significantly reduces Trans Epidermal Water Loss, indicative of skin barrier strengthening.

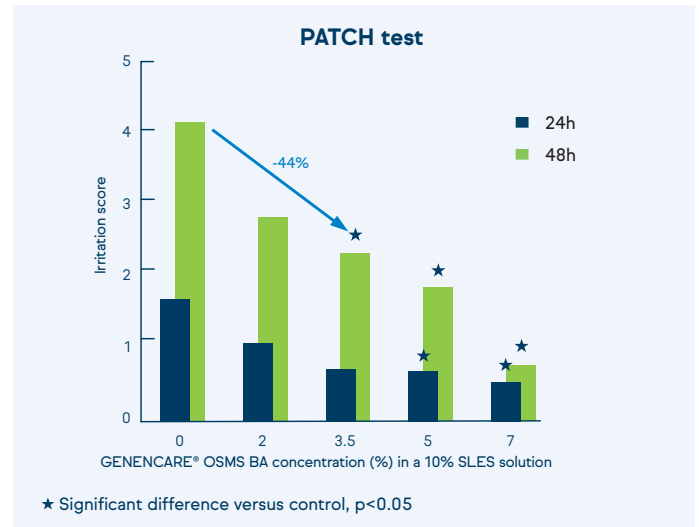


## Mitigation of skin irritation

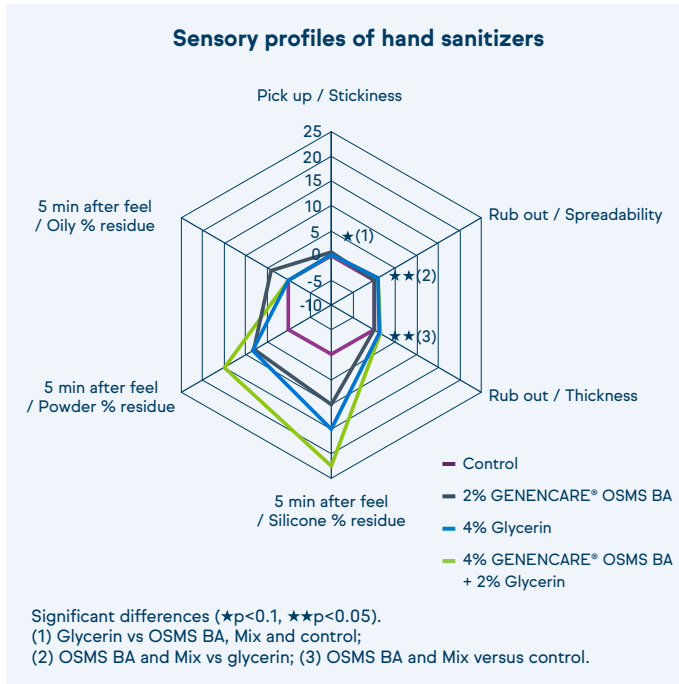
25 volunteers, 24h and 48h patch test

### Evaluation of the protective effect against surfactant irritation.

GENENCARE® OSMS BA significantly reduces the irritating effect of SLES by -44%. As an osmolyte, betaine helps protect skin proteins from denaturation by surfactants, as demonstrated in the Zein test.



## Sensory profile improvement



Trained panelists, Quantitative descriptive analysis, hand sanitizers

### Sensory synergistic effect between betaine and glycerin

2% GENENCARE® OSMS BA + 2% glycerin significantly improves the sensory profile of hand sanitizer, compared to 4% glycerin.

#### During Pick up and Application

- Reduced stickiness
- Improved product spreadability

#### After-feel 5 min

- Provides a silky feeling (mix of silicone and powdery feeling)
- Decrease the oily feeling of the residue

# BENEFIT MATRIX SKIN CARE



|   | Mechanism of action   | In-Vitro Tests   | Clinical Tests  |
|---|---|--|---|
|    | <b>Moisturization</b>   |  |   |
|   | <p><b>Humectancy</b><br/>Osmoprotection / Osmosis<br/>Control of water balance</p>  | <p>Osmoprotection of keratinocyte and fibroblast cultures (hyperosmotic and UV stress)</p>   | <p>24 hours and 4 weeks moisturization studies</p>  |
|    | <b>Protection</b>   |  |   |
|   | <p><b>Osmoprotection / Protein protection against protein denaturation</b><br/>1) Stabilization of protein 3D conformation<br/>2) Cell membrane protein integrity improvement</p> | <p><b>Against water loss</b><br/><i>TEER test</i> – Strengthens keratinocytes' Tight Junctions</p> <p><b>Against surfactant irritation</b><br/><i>ZEIN test</i> – Decreases solubility of zein protein</p> | <p><b>TEWL test</b><br/>Improves skin barrier integrity</p> <p><b>Patch test</b><br/>Mitigates irritation of surfactants</p>          |
|  | <b>Sensory</b>  |  |   |
|   | <p><b>Water management</b><br/>Betaine retains water but doesn't immobilize it.</p>   |  | <p><b>Sensory evaluation</b><br/>Helps reduce stickiness, improve spreadability, provide silky feeling and decrease oily feeling.</p> |





# HAIR CARE

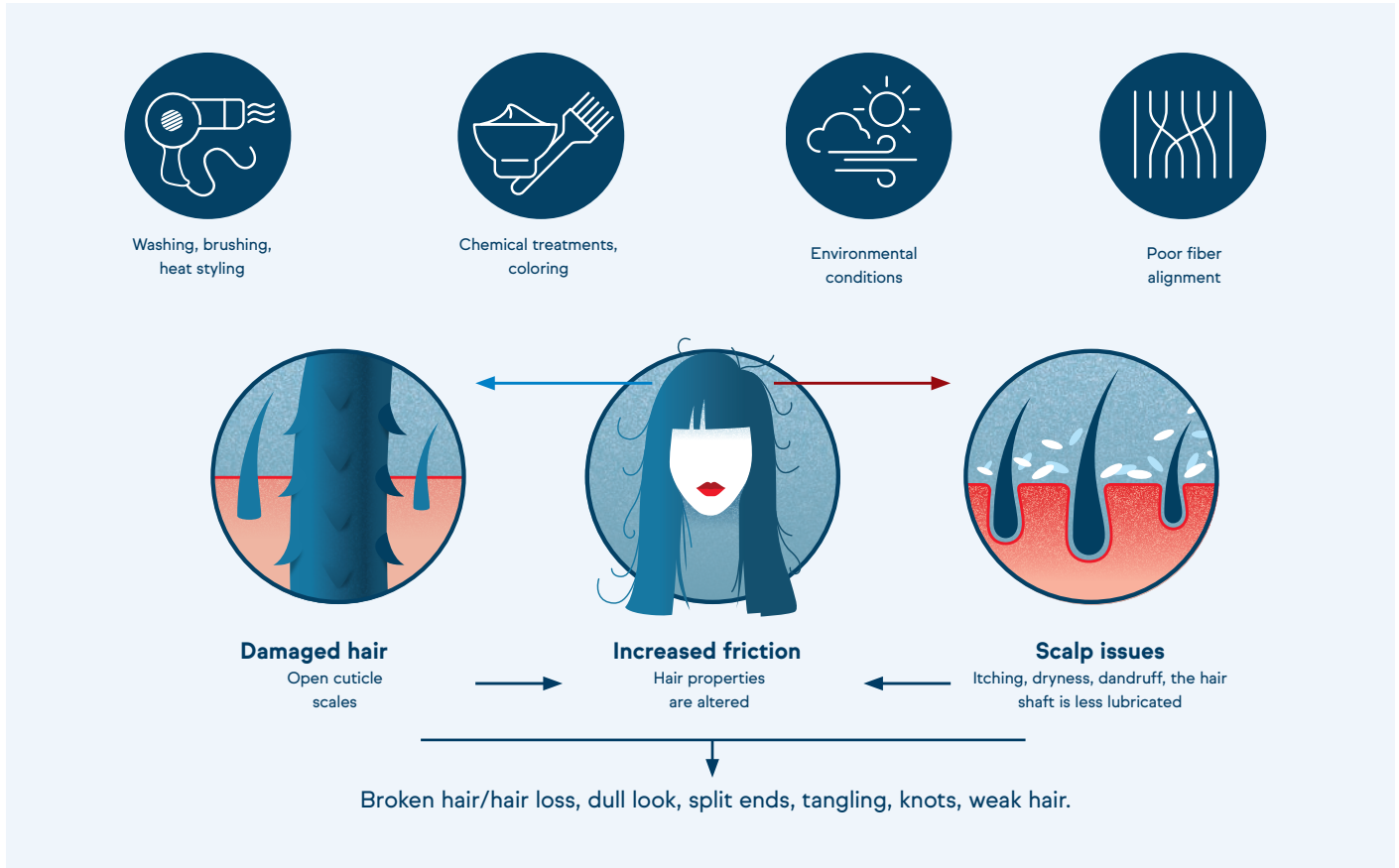


# GENENCARE® OSMS BA BETAINE HAIR SCIENCE

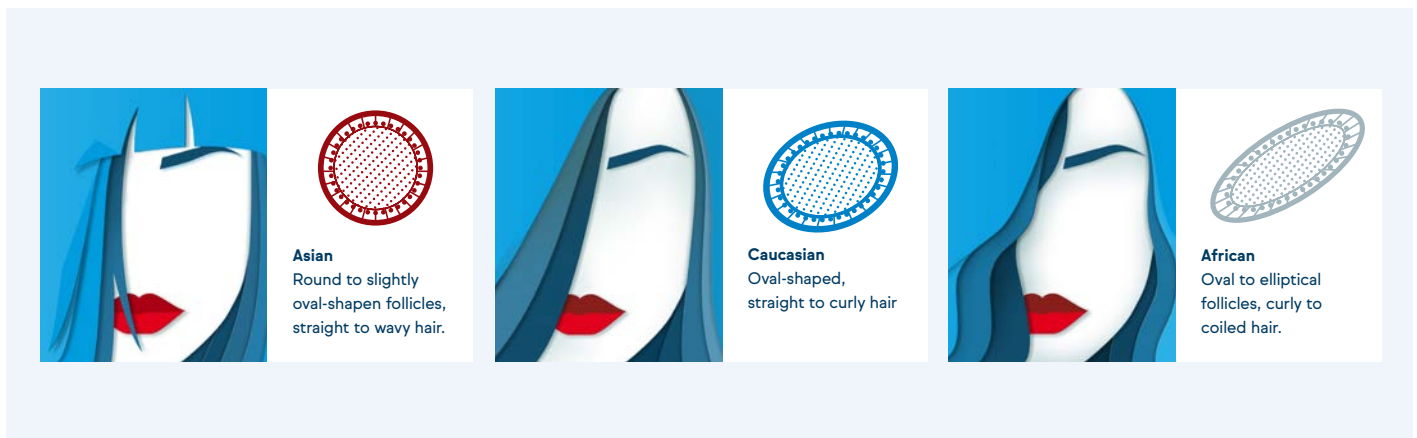


## How does hair get damaged?

Both external and internal factors are stressing the hair & scalp



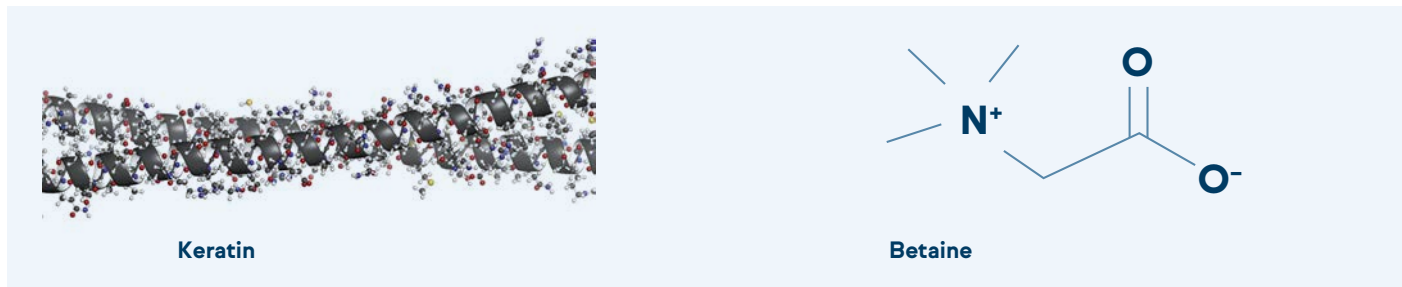
## Three main types and shapes of hair





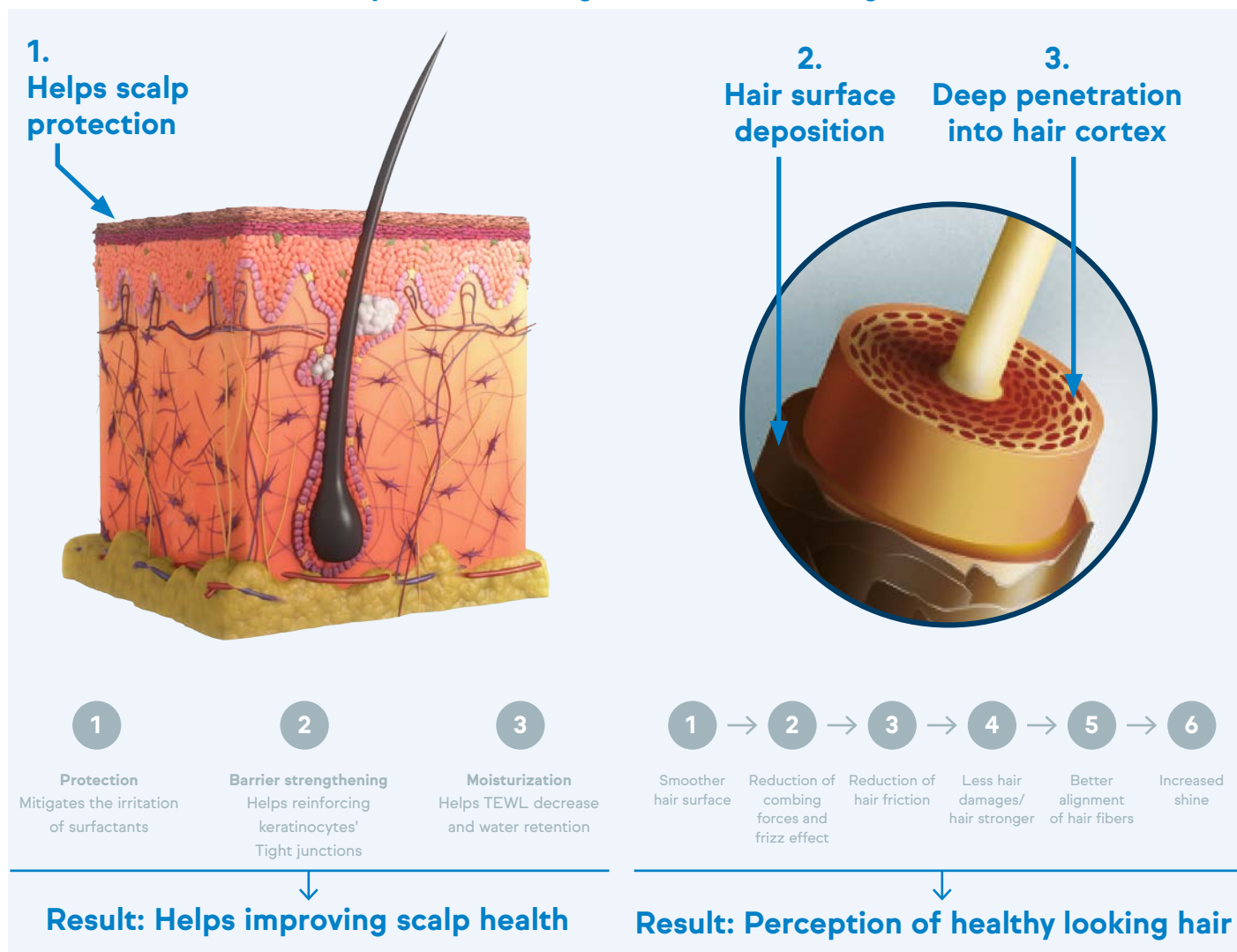
# GENENCARE® OSMS BA BETAINE MODE OF ACTION

## Betaine has a strong affinity with keratin



- **Keratin** is a key structural protein in hair. It is a negatively charged molecule.
- **Betaine** is a small amino acid derivative naturally present in hair. Zwitterion with both positive and negative charges. At low pH, it is mainly positively charged and has better affinity with keratin. Different than cocamidopropylbetaine.

## GENENCARE® OSMS BA provides stronger, healthier-looking hair



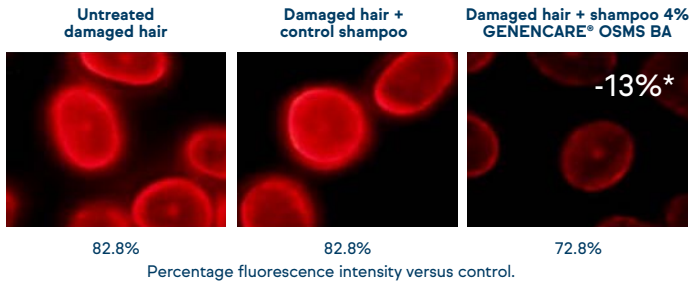


# GENENCARE® OSMS BA BETAINE INSTRUMENTAL TESTS



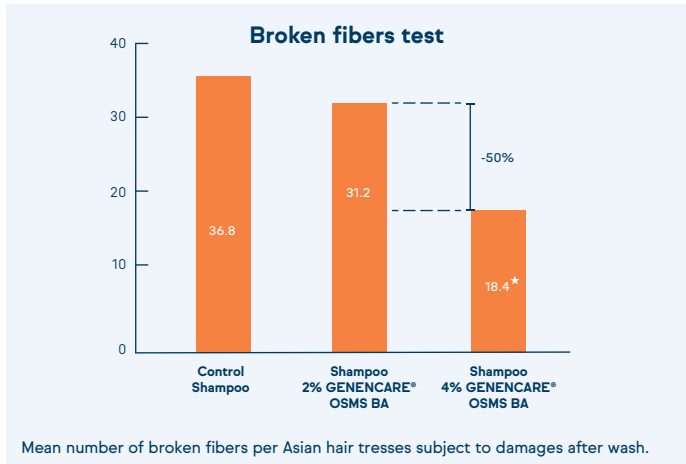
## Penetration into cortex for improved structure and strength

Cortical scanning fluorescence microscopy of double bleached Caucasian hair.

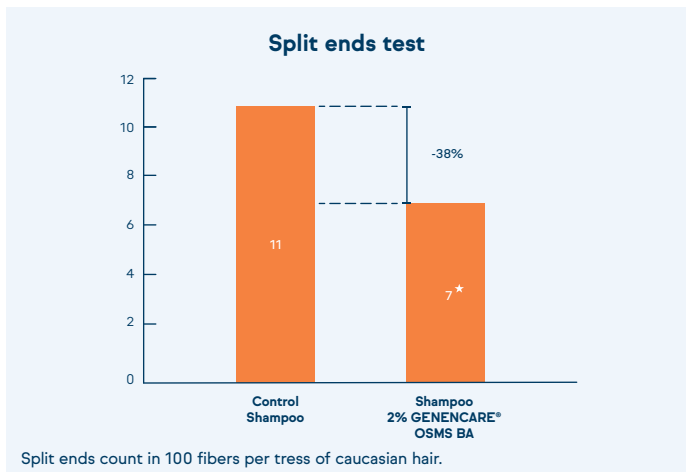


GENENCARE® OSMS BA penetrates deeply into the hair cortex and binds to the damaged sites.

The fluorescent red dye, Rhodamine B (RhB) binds to damaged sites. A higher fluorescence represents higher damages. Less fluorescence indicates that hair is less damaged and that betaine occupies the damaged sites instead of RhB.



Mean number of broken fibers per Asian hair tresses subject to damages after wash.



Split ends count in 100 fibers per tress of caucasian hair.

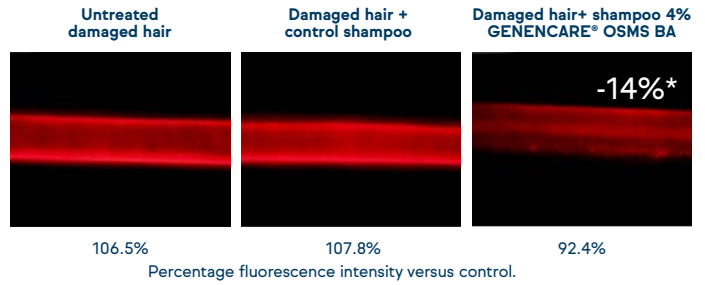
GENENCARE® OSMS BA contributes to making hair stronger and more resistant to breakage and split ends.

\* Significant difference versus control shampoo (p<0.05)

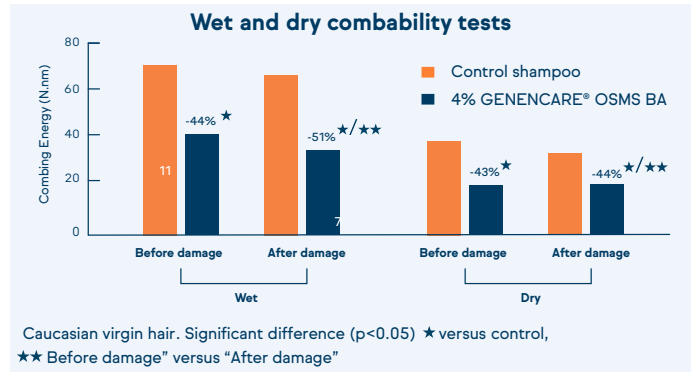
Additional test results on Caucasian, Asian and Brazilian virgin hair showing the protective effect of GENENCARE® OSMS BA are available upon request

## Deposition on surface for improved combability & frizz control

Surface scanning fluorescence microscopy of double bleached Caucasian hair.



GENENCARE® OSMS BA deposits on the hair surface and binds to damaged sites, contributing to improving the hair condition.



Caucasian virgin hair. Significant difference (p<0.05) \* versus control, \*\* Before damage" versus "After damage"

GENENCARE® OSMS BA helps improve wet and dry combing.

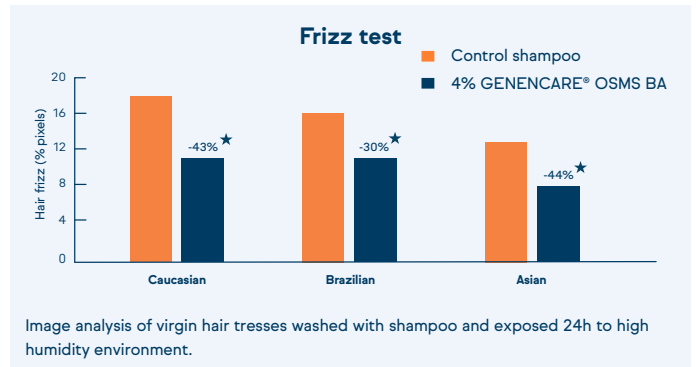


Image analysis of virgin hair tresses washed with shampoo and exposed 24h to high humidity environment.

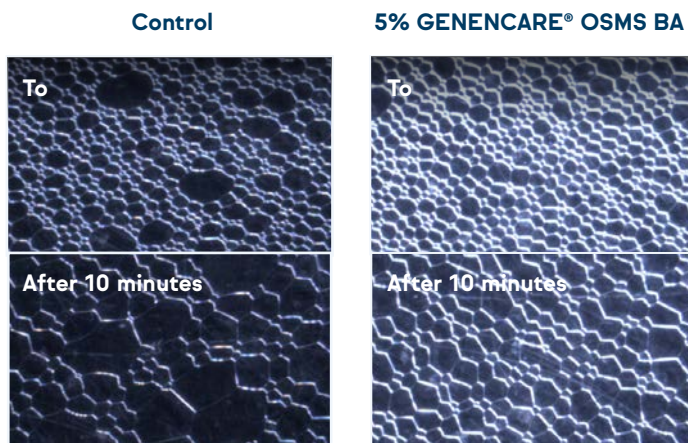
GENENCARE® OSMS BA helps reducing frizz hair. Fibers are better aligned providing a healthier hair look.

Reduction in combing force and frizz will result in less hair damage due to styling and, over time, leave the hair stronger than it would have been without GENENCARE® OSMS BA. Frizz reduction results in increased shine (better alignment of hair fiber) and perception of healthy looking hair.



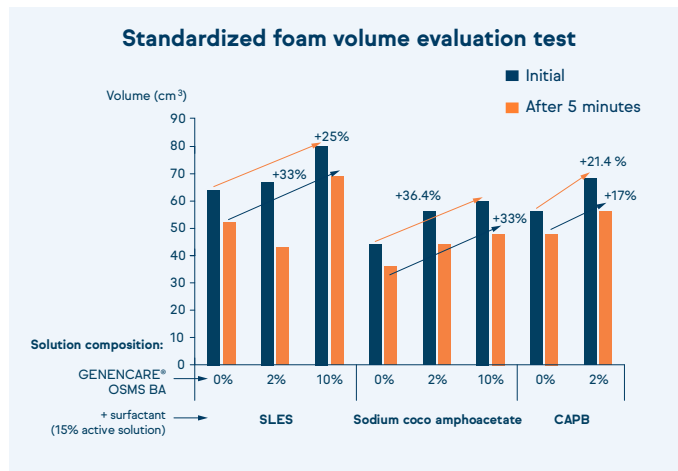
# GENENCARE® OSMS BA BETAINE INSTRUMENTAL TESTS

## Foam volume improvement



Microscopic pictures (X0,78) of the foam structure of a facial cleanser.

GENENCARE® OSMS BA helps improve foam structure, volume, quality and stability over time.



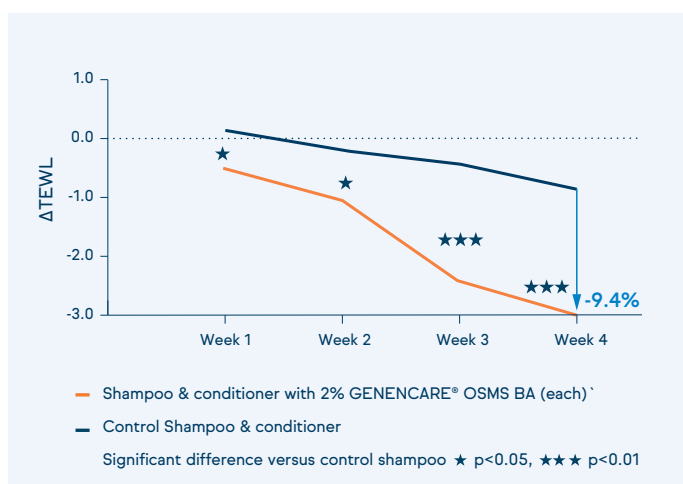
The addition of 2% and 10% GENENCARE® OSMS BA in a surfactant solution increases the foam volume.

# CLINICAL TESTS

## Improvement of the scalp barrier integrity

### 4-week in-use study

41 volunteers, TEWL measurement



### Evolution of the scalp Trans Epidermal Water Loss over 4 weeks

- 39 Brazilian volunteers (37-53 y.o.)
- Dry and sensitive scalp (itchiness)
- Wavy & dry hair
- Half head application of a shampoo + conditioner each containing 2% GENENCARE® OSMS BA
- Product application frequency: 3 times a week

Over 4-week of regular use of shampoo and conditioner containing GENENCARE® OSMS BA, the TransEpidermal Water Loss of the scalp is reduced, indicative of a stronger skin barrier.

# BENEFIT MATRIX HAIR CARE



|  | Mechanism of action  | Instrumental and Clinical tests   |
|--|--|---|
|  | <b>Helps improve hair strength</b>   |   |
|  | <ul style="list-style-type: none"> <li>• Penetrates to the hair cortex</li> <li>• Binds to damaged sites.</li> </ul>   | <ul style="list-style-type: none"> <li>• Cortical scanning fluorescence microscopy.</li> <li>• Broken fibers test (Hair damaging with T°C and combing cycles).</li> </ul> |
|  | <b>Helps improve hair condition</b>  |   |
|  | <ul style="list-style-type: none"> <li>• Deposits on hair surface and binds to damaged sites.</li> <li>• Hair surface is smoother, resulting in less friction.</li> </ul>                  | <ul style="list-style-type: none"> <li>• Surface scanning fluorescence microscopy.</li> <li>• Combability tests.</li> </ul>   |
|  | <b>Reduces the frizz effect</b>  |   |
|  | <ul style="list-style-type: none"> <li>• Deposits on hair surface and binds to damaged sites.</li> <li>• Hair fibers are better aligned, resulting in less friction and damage.</li> </ul> | <ul style="list-style-type: none"> <li>• Surface scanning fluorescence microscopy.</li> <li>• Frizz control test.</li> </ul>  |
|  | <b>Helps protect the scalp</b>   |   |
|  | <ul style="list-style-type: none"> <li>• Osmoprotection.</li> <li>• Strengthens epidermal Tight Junctions.</li> <li>• Mitigates irritation of surfactants.</li> </ul>                      | <p>Clinical tests</p> <ul style="list-style-type: none"> <li>• TEWL measurements (Trans Epidermal Water Loss) on scalp.</li> <li>• Skin patch test.</li> </ul>            |



# GENENCARE® OSMS BA BETAINE

## PRODUCT INFORMATION

### Product identification

|                      |                                      |
|----------------------|--------------------------------------|
| <b>INCI name</b>     | Betaine                              |
| <b>Chemical name</b> | Trimethylglycine,<br>glycine betaine |
| <b>CAS number</b>    | 107-43-7                             |
| <b>HS Code</b>       | 2923 9000 90                         |

| Typical characteristics                     |                                       |
|---|---------------------------------------|
| <b>Appearance</b>                           | free-flowing white crystalline powder |
| <b>Bulk density</b>                         | 0.6–0.8 g/ml                          |
| <b>Melting point</b>                        | 241–242°C                             |
| <b>Molar weight</b>                         | 117.15 g/mol                          |
| <b>pH (5% solution in DiH<sub>2</sub>O)</b> | 5–7                                   |
| <b>Betaine solubility at 25°C in:</b>       |                                       |
| <b>Water</b>                                | 160g/100g (readily soluble in water)  |
| <b>Ethanol</b>                              | 8.7g/100g                             |
| <b>Purity (assay on dry substance)</b>      | 99.0–100.0% betaine                   |
| <b>Moisture</b>                             | max 2% (when packed)                  |

## APPLICATION

GENENCARE® OSMS BA is a cosmetic ingredient; solely intended for cosmetic and personal care products.

#### Suggested uses

- Skin care (ex: moisturizing serums and creams, body lotion, sun care, face cleansers and masks, baby cream)
- Hair care (ex: shampoo, conditioners, scalp treatments)
- Hygiene (ex: shower gels, intimate wipes)
- Make-up (ex: water-based foundations)

**Recommended use** 2–5 % (maximum supported use: 10%, except toothpaste max 5% for 0-3 y.o. babies.)

**pH range of use** 3.0–8.0; Avoid high pH formulations pH≥10.

#### Formulation

- Readily soluble in water therefore easy to formulate with.
- Can be formulated either by cold or hot process.
- Gives colorless and odorless solutions in water.
- Compatible with most ingredients.
- High concentration does not impact emulsion stability.

**Additive** No additives

Starting point formulations are available for download on [ULProspector.com](http://ULProspector.com)

### Environmental profile

- Carbon Neutral, based on cradle-to-gate Life Cycle Assessment 2021
- No petrochemical solvent used
- Readily biodegradable
- Not classified as hazardous to the environment

Please refer to SDS and separate Product Declaration

### Certifications

|                                  |   |
|----------------------------------|---|
| <b>Natural certification</b>     | ECOCERT, COSMOS, NATRUE Approved                                  |
| <b>Natural Index (ISO 16128)</b> | NI=1, NOI=1   |
| <b>Kosher and Halal</b>          | Certified   |
| <b>Production</b>                | Cosmetic GMP, ISO 22716:2007                                      |
| <b>Upcycling</b>                 | Upcycled certified™ ingredient by UFA (Upcycled Food Association) |

For other statements, please contact your sales representative.



NATRUE Approved

### Regulatory information

- Listed on relevant global chemical inventories.
- China: Compliant with CSAR and registered in NMPA system.

For other statement and regulatory information, please refer to SDS and separate Product Declaration or contact your sales representative.

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[bioscience.iff.com/solutions/personal-care](https://bioscience.iff.com/solutions/personal-care)

## Health & Biosciences

Home & Personal Care

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