WHEN SHOULD **HYLO** DUAL® BE RECOMMENDED?

Burning, itching and watery eyes, the sensation of having a tiny grain of sand in the eye or a feeling of dryness are typical symptoms of irritated eyes. Often this indicates that the eyes are not sufficiently lubricated.

HYLO DUAL® lubricates the cornea and conjunctiva and prevents the excessive evaporation of tears. The stabilisation of the tear film, in particular that of the lipid layer, relieves eye irritations, which are associated with symptoms of inflammation or those caused by allergies. The burning and itching sensation in the eyes disappears.

HYLO DUAL®

Shelf life of 6 months after opening

- ✓ Stabilisation of the tear film lipid layer
- ✓ Lubrication through osmoprotection
- ✓ Ectoine-hydro-complex relieves symptoms associated with inflammation and allergy
- ✓ Preservative and phosphate free

*intensity of lubrication due to concentration of hyaluronic acid and the resulting viscosity; + = beneficial ingredient supporting the lubrication or regenerating effect (in addition stabilizing the lipid phase in case of **HYLO** DUAL®)

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HYLO DUAL® THE DUAL MODE OF ACTION

High quality hyaluronic acid and ectoine to stabilise the tear film and help soothe sore and allergy-prone eyes.

HYLO® EYE CARE
LUBRICANT EYE CARE SYSTEM

DUAL MODE OF ACTION WITH HYALURONIC ACID AND ECTOINE

The high quality hyaluronic acid used in **HYLO** DUAL® products provides uniform, stable and particularly long-lasting lubrication of the eye surface.

The ectoine used in **HYLO** DUAL® is isolated from microorganisms that survive under the harshest conditions. To protect themselves from extreme environmental conditions, these microorganisms synthesise the natural substance ectoine. This enables them to compensate for extreme variations in the surrounding salt or water concentration.

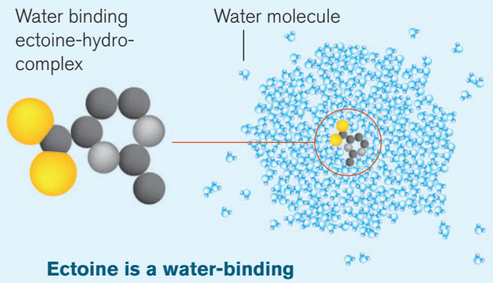
The role of ectoine in **HYLO** DUAL® is to increase the flow of water back to the ocular surface cells, therefore forming a physiological barrier against inflammatory irritations on the cornea and conjunctiva. At the same time ectoine stabilises the lipid phase of the tear film, which protects against excessive evaporation of lacrimal fluid.

The dual mode of action prevents the occurrence of irritations caused by environmental factors, which often lead to inflammatory allergic symptoms such as itching and burning.

- ✓ High quality hyaluronic acid and ectoine
- ✓ Preservative and phosphate free
- ✓ Compatible with contact lenses
- ✓ High yield (minimum 300 drops)

Effect of ectoine:

Influencing the structure of the surrounding water



Ectoine is a water-binding substance. Ectoine:

- ✓ increases the number of water molecules in its immediate vicinity
- ✓ increases the bond between neighbouring water molecules
- ✓ therefore strengthens the water binding to itself

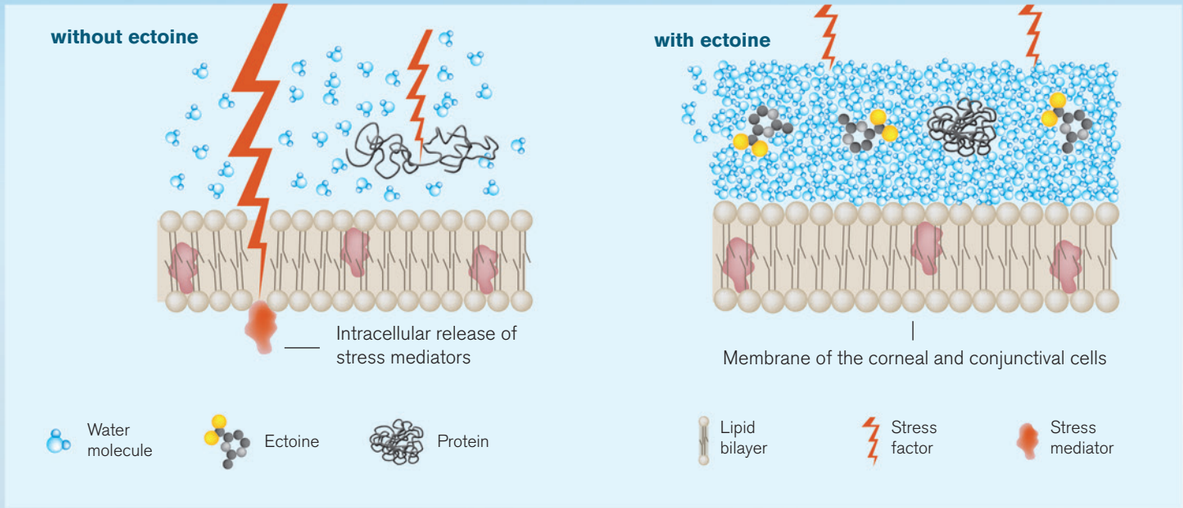
Key information about ectoine

The earth is colonised by millions of different types of microorganisms. The extremophiles can be found under extreme conditions such as hot water geysers, kilometres of thick Antarctic ice and even in salt water lakes. They live where no-one would expect to find life and where conditions prevail that were long thought to be absolutely hostile to any living organism.

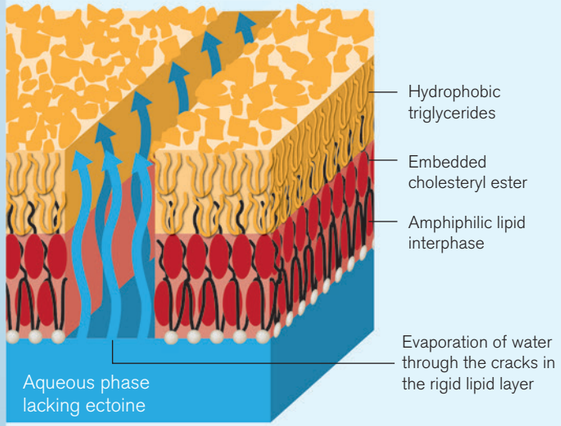
The adaptation to these extreme environmental conditions is made possible through extremolytes. These are low molecular weight protective substances that stabilise biological membranes, proteins and nucleic acids. This stabilisation protects the microorganisms from environmental stresses such as severe temperature variations, high levels of UV radiation or dehydration. One of the best known extremolytes is ectoine.

Effect of ectoine:

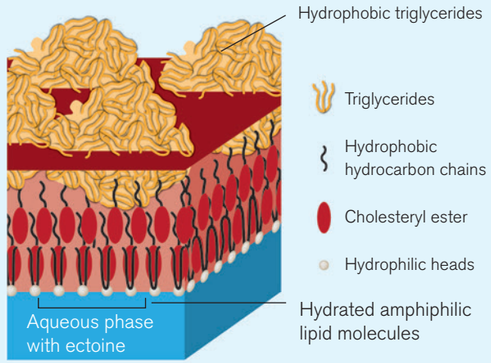
Anti-inflammatory properties



Unstable lipid phase of the tear film without ectoine



Stabilised lipid layer containing ectoine



Under the influence of ectoine the rigid lipid phase is transformed into an elastic layer. When the eye blinks, this layer is more easily compressed and spread across the ocular surface without being disrupted.

In particular, dehydration-resistant and halophilic microorganisms accumulate ectoine for protection. Ectoine is both an osmoprotectant and a stabiliser of biological structures, i.e. biopolymers.

Ectoine causes more water to bind to the membrane. In this way it protects cells from inflammatory reactions towards environmental stress factors such as dehydration (e.g. caused by hyperosmolar tears), UV radiation or airborne allergens.[1]

- ✓ Ectoine has a protective effect on cell membranes.[2]
- ✓ Ectoine reduces inflammatory processes.[3]
- ✓ The water-rich protective shield of ectoine protects epithelial cells against allergens.[4]
- ✓ Furthermore, ectoine has a stabilising effect on the tear film lipid phase.[5]

On the ocular surface tears form a heterogeneous, highly structured film comprised of layers that vary in thickness and consistency. With every blink of the eye, the tear film is subjected to a three-dimensional compression prior to its renewed expansion. The lipid phase should in this process be reversibly restored.

Ectoine increases the compressibility of the tear film. Consequently, the elasticity of the lipid phase is enhanced leading to a homogeneous spreading of the tear film over the ocular surface. This improved distribution of the lipid phase counteracts excessive evaporation of tears.[6]

[1] Galinski, E.A., 1993; Galinski, E.A. et al., 1985; Lippert, K. and Galinski, E.A., 1992; Bünger, J. et al., 2001; Galinski, E.A. et al., 1997
[2] Graf, R. et al., 2008
[3] Bünger, J. and Driller, H., 2004
[4] Werkhäuser, N. et al., 2014
[5] Harishchandra, R.K. et al., 2010
[6] Dwivedi, M. et al., 2014