

Cosmetic preparations against dry and tired eyes

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Until now, the use of titanium dioxide as an excipient in food, medicines, cosmetics and many other articles of daily life was considered harmless to health. But for some time now, concerns and restrictions have been increasing. We have compiled the background information for you.

Tired eyes signal the opposite of attractiveness. Reduced tear secretion and dry zones in the adjacent skin and eyelids are common companions. VDU work promotes susceptibility to headaches, which also affect the eyes. Physical inactivity and low humidity also leave their mark – especially in the winter months.

The dry eye

The symptomatology of dry eye resulting from these and possibly other factors is a medical indication in contrast to dry skin. The German Berufsverband der Augenärzte Deutschlands e. V. and the Deutsche Ophthalmologische Gesellschaft e. V. describe it in their guideline – as of November 2015 – as follows: "Dry eye is a multifactorial disease of the ocular surface, characterised by a loss of tear film homeostasis and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, inflammation and damage to the ocular surface and neurosensory abnormalities play an aetiological role."

Pre-existing diseases of the skin and immune system, infections and endocrinological, neurological, psychological and rheumatological disorders as well as medication are statistically considered risk factors. Critical working and environmental conditions also include constant draughts and low humidity, combined with low air pressure (aircraft, air conditioning).

The tear film

Tear secretion and tear film are a complex system. The eyes are constantly in motion. In the interaction of sebum-secreting meibomian glands, the lacrimal glands and the mucous glands of the conjunctiva with the blinking of the eyes, a liquid film (tear film) is produced on the surface of the eye, which consists of three main fractions:

- Fatty substances (lipids), including tri-

glycerides, cholesterol and its esters, as well as phospholipids such as the phosphatidylcholine known from plasma membranes and liposomes;

- Water containing salts, (poly)saccharides, antimicrobial peptides (AMPs) and growth factors;
- Mucous substances composed of peptides that preferentially adhere to the ocular epithelium.

Redness and irritation, conjunctivitis and infection disrupt the interaction of the tear film and blinking. If the "windshield wiper" is not working properly, there is a foreign body sensation and dry eye.

Adjuvant corneotherapy

In addition to a thorough diagnosis, the identification of possible triggers and their elimination or the resulting medical measures, cosmetic preparations with a causal effect are a great help in the treatment of dry eye. This type of treatment is also called adjuvant corneotherapy.

The sensitivity of the eyes considerably limits the spectrum of possible components for the preparations. In addition to chemical aspects, physical aspects must be taken into account with regard to the physiology of the eyes.

The composition of eye preparations

It is obvious to use components of the three fractions of the tear film for treatment and to use them in an isotonic composition. In addition, other physiological substances are conceivable that specifically influence inflammatory reactions – such as essential fatty acids, which are already contained in phosphatidylcholine, among others. Vitamins can also be useful.

Of importance are the consistency and the spreading behaviour, from which the application forms of the preparations result. The

package insert must describe where exactly and at what frequency the preparations are to be applied. For example, spray lotions must not be directed at the open eye. They should act indirectly. That is, they are applied to the closed eyelid and the skin around the eye, from where they spread towards the tear film. This technique has the advantage of not causing streaks on the eyes and avoiding irritation. When liposomes made of phosphatidylcholine are used, they enter the tear film via the edge of the eyelid.

In addition to water, the following physiologically compatible substances can be used in eye preparations:

- Phosphatidylcholine – component of plasma membranes and the tear film,
- Lipids of the tear film as well as triglycerides with essential ω -3 and ω -6 fatty acids, which form anti-inflammatory metabolites,
- Mucins of the tear film or physiological alternatives such as hyaluronic acid and other polysaccharides (alginates, xanthan gum) to improve gliding,
- Mineral salts such as sodium chloride (table salt) and phosphates (pH buffer),
- Amino acids – analogous to the Natural Moisturizing Factor (NMF),
- Vitamins, especially vitamin A and its derivatives (\rightarrow regeneration) as well as vitamin E (\rightarrow protection) and D-panthenol (\rightarrow anti-inflammatory and stimulating cell proliferation).

In addition to the listed mucilages, polymer film formers such as polyvinylpyrrolidone (PVP) and carbomers (polyacrylates) are sometimes used.

Eyelid lotions should have a liposomal structure in order to avoid additives such as emulsifiers, which usually have an irritating potential even in low doses. They are easy to spray onto the closed eye and save the need to instil them into the conjunctival sac.

Other excipients should also be avoided as far as possible. This applies in particular to preservatives listed in the Annex to the European Cosmetic Regulation. All preservatives in the Regulation have a considerable allergy potential. Every pollen allergy sufferer knows how unpleasant allergens can be on the eye. Sterile preparations in ampoule form are therefore desirable, but not always feasible, especially when preparations are applied over a longer period of time. Glycerine or glycols can be used as an alternative to preservatives. In low

concentrations and with proper application, even alcohol is easily tolerated.

Anhydrous cosmetic preparations such as lipogels (oleogels) are particularly suitable for complementary care around the eye, as they naturally do not require preservation. In order to be absorbed well, they consist of triglycerides and skin lipid components such as cholesterol or its plant variants (phytosterols) and Squalene (INCI) or its hydrogenated form, Squalane (INCI). These components are also contained in the tear film. In contrast, vaseline and mineral oils are counterproductive, especially in high concentrations, as they remain on the surface and cause occlusive swelling and associated swelling in the skin tissue underneath. Swelling of lipid-rich products is generally avoided by adding phosphatidylcholine, which is contained in the tear film, as phosphatidylcholine accelerates the penetration of physiological lipids.

A special position is occupied by skin-firming compositions against bags under the eyes and dark circles. In these cases, isoflavonoids (phytohormones), saponins, peptides and extracts are used, as well as protease inhibitors and anti-inflammatory agents for irritated and reddened skin.

Additional preventive measures

In addition to diagnosing the causes, eliminating them as far as possible and treating tired and dry eyes with medical and/or cosmetic preparations, regeneration in the form of sleep and breaks during and after strenuous work at a computer screen or comparable activity must not be neglected. Increased physical exercise and targeted eye gymnastics to stimulate circulation and microcirculation, along with a balanced diet and a reduction in nicotine consumption, make a not inconsiderable contribution to the medium- and long-term reduction of eye complaints. Even alternating showers to tighten the connective tissue have proven successful in this regard.

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