NEW FORMULATIONS FOR DRY EYE TREATMENT

NUEVAS FORMULACIONES PARA EL TRATAMIENTO DEL OJO SECO

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Dry-Eye Syndrome (DES) is a highly-prevalent eye condition affecting approximately 10%-15% of the population. This syndrome can be considered as a set of problems arising out of an alteration in the lacrymal film. This alteration has, as an immediate consequence, the loss of the optimal optical properties of the film as well as the absence of lubrication, hydration, protection, nutrition and cleansing of the surface of the eye (1).

Dry eyes have traditionally been classified into two large groups: water-deficient or hyposecreting dry eye and evaporative dry eye. This division is not however appropriate as there are hyposecreting and evaporative components to a greater or lesser extent in all dry eye conditions, regardless of their etiology.

While all authors coincide in stating that DES is the result of an alteration in the pre-corneal film, there is considerable controversy with regard to the etiology and treatment of this condition (2).

Some authors posit that DES is a problem with an immune inflammatory basis. Their hypothesis depends on the detection of inflammatory infiltrates located in lacrymal glands and the conjunctiva, in samples taken from patients with DES associated or not with Sjögren’s syndrome. Other authors have aimed their studies at demonstrating the relationship between DES and a deficit in the circulating levels of certain hormones (mainly androgens) fundamentally basing their theories on the greater predisposition of post-menopausal women to develop this pathology (3). The administration of systemic androgen supplements seems, in these cases, to increase the tear volume, thus alleviating the DES symptoms. The beneficial effect of these agents seems to originate in the stimulation of lipid secretion in the meibomian or tarsal glands, thus improving the conditions of the lacrymal film, and also the anti-inflammatory effect and the inhibition of the lacrymal apoptosis of androgens.

The surface of the eye is known to be made up of the conjunctival epithelium, the corneal epithelium, the accessory lacrymal glands and the meibomian or tarsal glands. This surface is coated in a continuous film known as the pre-corneal or lacrymal film. Until a few years ago, the widely-accepted theoretical structure included three types of components (lipidic, water-serous and mucinous) distributed in three layers: lipid, water and mucinous. Recent studies have considered a structure comprising a combination of the aqueous-proteic and mucinous components to form a hydrated gel. This gel would in turn be protected by a lipidic film made up mostly by the products from the meibomian glands and with the job of preventing the evaporation of the tear and improving the stability of the lacrymal film. This film is altered in dry eyes and this constrains the choice of vehicles to be used in the production of formulations.

Regardless of the origin of the illness, the therapeutic approach for DES basically focuses on improving its symptoms (4). These treatments include: replacement of natural tears (by means of artificial tears or saliva), conservation of the existing tears (through occlusion of the drainage system or by mechanisms to diminish evaporation) or the stimulation of a greater production of natural tears (through secretagogue or tear-mimicking drugs). Treatment with artificial tears currently constitutes almost 80% of all therapies prescribed. The most innovative formulations on the market are made up with...

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of different types of preparation: hypotonic solutions, lipid-containing tears to prevent evaporation of water from the lachrymal film, tears with bioadhesive properties to increase water-retention and formulations containing substances protecting against the cell stress produced by the tears’ hypertonicity.

In any case: What would the ideal formulation be like? For us it would be one with a design starting from the structure of the eye’s surface and an understanding of the function of each of its components. This would probably result in a combination of the formulations present on the market.

The ideal artificial tear would be hypotonic (down to an appropriate tonicity value without adverse reactions) and would contain lipids similar to those in the lachrymal film. These lipids are well known to be, by nature, either polar (phospholipids, sphingomyelin, ceramides and cerebrosides) or non-polar (wax esters, cholesterol esters, triglycerides, free fatty acids and hydrocarbons). In addition, it should also include bioadhesive components not only capable of increasing water retention but also able to increase the contact time with the surface of the eye (bioadhesive polymers are capable of interacting with the sialic acids in the mucin) (5) and finally it must incorporate active substances protecting the corneal epithelium. If, on top of all this, these formulations could also incorporate hormones with androgenic activity or active substances capable of increasing the production of tears or of reducing inflammation, this would be extremely interesting.

In conclusion, we are facing a stimulating panorama, an illness constantly increasing in our modern day lives and with new therapies requiring multidisciplinary research based on pharmaceutical technology and both basic and applied ophthalmology.

REFERENCES