



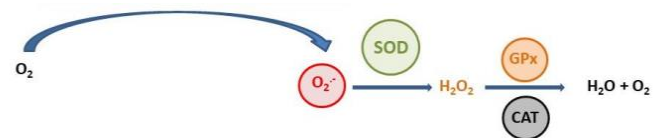
# ANTIOXIDANT COMPOSITION FOR EYE DISEASES

## Description

Ophthalmology offices attend daily to a large number of patients suffering from diseases potentially causing visual impairment and blindness, and many other consultations for a wide range of eye problems. We must highlight those affecting refractive errors (myopia, hyperopia, astigmatism, presbyopia), ocular surface (dry eye syndrome, keratoconus, corneal dystrophies), and those affecting the retina or optic nerve (retinopathies, retinal vascular accidents, macular degeneration and/or optic neuropathies), as well as neurodegenerative pathologies (glaucoma, hereditary retinal dystrophies and genetic syndromes). All of them, from the mildest to the most severe, have in common pathogenic processes such as oxidative stress, inflammation and/or apoptosis.

Researchers from FISABIO, UPV, UV, CSIC and CEU have developed an ophthalmic composition that includes superoxide dismutase enzyme, hyaluronic acid and sodium edetate (EDTA) in the form of artificial tears or eye drops, partly to prevent and certainly to treat these ocular diseases or pathologies that involve oxidative stress, being also useful for post-operative use of ocular anterior segment surgery, and/or laser treatment in which both pathogenic mechanisms occur: oxidative stress and inflammatory response.

This same composition can also be prepared for topical administration in a pharmaceutical presentation other than eye drops, such as in the form of a bath, gel or eye cream, but also for oral administration in the form of a tablet/capsule or solution.



## Technical advantages

- The pharmaceutical composition is highly stable and can be stored for 2 months (for all concentrations tested and temperatures analyzed).
- Hyaluronic acid has moisturizing, hydrating and lubricating, healing, regenerating and protective properties of the structures of the ocular surface, and the EDTA salt acts as a chelating agent of free metal cations, thus achieving a synergistic effect that enhances the antioxidant activity of the SOD enzyme.
- The administration in the form of eye drops, which does not exist in the current market, instead of oral use (like most of those on the market) allows lower doses to be used both in preventive treatments and in the treatment of the aforementioned ocular diseases. This is because topical administration is generally more effective than oral administration.

The figure shows the right eye of a patient with acute conjunctivitis caused by exposure to dust particles. It presents with diffuse conjunctival hyperemia, photophobia and epiphora, and may be associated with burning, rubbing, itching, discharge and blurred vision. The process affects both eyes equally. Atmospheric, domestic and workplace pollution are the main causes of this pathology, which is frequent in ophthalmological consultations. The main pathogenic mechanisms are the induction of oxidative stress and inflammatory response.

The damaging agent causes the formation of reactive oxygen species, the first to be formed being superoxide anion ( $O_2^-$ ). This is generated in the mitochondria during auto-oxidation, or by the action of cytoplasmic oxidase enzymes (xanthine oxidase, cytochrome P450 and others). When produced, it can be inactivated spontaneously, but much more rapidly by the action of the enzyme superoxide dismutase (SOD), the enzyme we are concerned with, which catalyzes the dismutation of  $O_2^-$  forming hydrogen peroxide ( $H_2O_2$ ) and oxygen. Finally, the hydroxyl radical ( $OH\cdot$ ) can be produced from water by ionizing radiation, or by interactions of transition metals with  $H_2O_2$ , as occurs in the presence of iron, and can be seen in this figure.



## State of development and Intellectual Property Rights

Tests carried out on mice with the eye drops administered topically, at various concentrations tested, for 4 consecutive weeks, did not induce harmful effects on the anterior ocular segment and appendages, thus presenting good tolerability and absence of toxicity.

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