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Nanomicelle Formulation for Topical Treatment of Acute Optic Neuropathies

Researchers from Stanford have developed a novel topical pharmaceutical composition comprising of a chemical inhibitor encapsulated in nanomicelles for the treatment of vision loss associated with acute optic neuropathies.

Acute optic neuropathies, including nonarteritic anterior ischemic optic neuropathy (AION), traumatic optic neuropathy, and perioperative optic neuropathy, represent significant causes of vision loss. Currently, there are no effective treatments for restoration of vision loss targeting neuroprotection in acute optic neuropathies. Traditional drug delivery to the posterior segment of the eye is challenging due to poor bioavailability and the need for invasive administration routes. While systemic or intravitreal injections can deliver therapeutics to the retina and optic nerve, these approaches carry risks of complications and are not suitable for chronic use.

To address these challenges, the inventors developed a topical formulation that encapsulates specific chemical inhibitor within nanomicelles composed of amphiphilic materials. This nanomicellar formulation enhances aqueous solubility and facilitates delivery of the inhibitor to the posterior segment of the eye upon topical administration. The specific inhibitors work by elevating retinal prostaglandin levels, which helps preserve retinal ganglion cells and optic nerve axons. The topical delivery route offers significant advantages over invasive procedures, including ease of use for repetitive applications, better patient compliance, accessibility, and lower risk of systemic complications—all of which enhance therapeutic outcomes.

Applications

- Treatment of nonarteritic anterior ischemic optic neuropathy (AION)

- Traumatic optic neuropathy therapy
- Topical ophthalmic drug delivery platforms

Advantages

- Non-invasive topical delivery
- Enhanced drug solubility and bioavailability through nanomicelle encapsulation
- Lower risk of systemic complications
- Improved patient compliance and ease of use

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