Reverse Thermal Gels for Ocular Drug Delivery

Published date: Aug. 28, 2016

Technology description

Background

Human eyes are often exposed to various risks of ocular diseases. They can be an age-related such as macular degeneration; virulent inflammations by foreign bodies such as endophthalmitis; and systemic side effects such as diabetic retinopathy, macular edema, and retinal vein occlusion. Delivery of therapeutic agents for ocular treatments can usually be limited by insufficient ocular uptake and side effects. The most prescribed conventional ocular dosage forms are eye drops, eye ointments and suspensions. They have major disadvantages such as poor bioavailability due to rapid precorneal elimination, normal tears turnover and conjunctiva absorption, frequent instillation of concentrated medication, side effects due to systemic absorption of drugs. Intravitreal drug injections are the most effective way to maximize drug concentrations in the eye and reduce the loss whereas limiting systemic exposure. However, the effective management of chronic ocular conditions requires long-term frequent local administrations with over- and underdoses. Those repeated intravitreal injections are not only invasive and inconvenient for patients, but they may also greatly increase the risk of complications such as intraocular pressure elevation, cataracts, and retinal detachment. Technology The therapeutic agents are conjugated with reverse thermal gels which undergo temperature triggered sol-gel phase transition and form a gel at physiologically important temperature. This material can form a gel by a simple injection in the vicinity of target area reducing the loss of therapeutic agents. Controlled release will sustain the vitreous concentration of the therapeutic agents in the therapeutic range longer with reduced side effects and treatment frequency achieving higher therapeutic index. The specific aim is to control the release of therapeutic agents using a functionalized reverse thermal gel that gels upon reaching body temperature.

Application area

Can be used to deliver antiangiogenic agents for macular degeneration, antibiotics for virulent inflammation and growth factors for ocular wound healings

Advantages

Most therapeutic agents can be conjugated to the reverse thermal gels
Density of the delivery system matches that of the vitreous fluid in the eye
Material forms a gel in the vitreous humor of the eye which leads to the sustained release of therapeutic agents and enhanced therapeutic index.

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