Bio-Inspired Siloxane Materials for Ocular Applications

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Technology description

It is estimated that there are over 30 million contact lens wearers in the United States.

In addition to vision correction, a contact lens should:
Maintain stable, continuous tear film for clear vision
Resist deposition of tear film components
Sustain normal hydration
Permeable to oxygen enabling corneal metabolism
Permeable to ions to maintain movement
Non-irritating and comfortable
Neither hydrophobic nor lipophilic

The number one most implanted medical device in the US is artificial eye lenses or intraocular lenses (IOLs) that are implanted during cataract surgery. Roughly 2.6 million procedures are performed annually in the US. IOLs have many the same requirements as contact lenses, with antimicrobial properties and long term durability being even more important and cost constraints far less than that in the contact lens market.

The current state-of-the-art enables high-volume, low-cost production of corrective lenses. These often are siloxane-containing hydrogels, which have addressed the critical need for oxygen transmission to the avascular cornea. [1]
While effective, there are common complaints from contact lens wearers. These complaints include dryness (the hydrogel actually pulls water off the eye), lens deposits and resulting eye inflammation. [2]
Researchers at CSU have incorporated hyaluronan into a silicone polymer for use in ocular applications. Silicone provides excellent oxygen permeability and mechanical properties.
The incorporation of the hyalruonan:
Increases lubricity and wettability;
Reduces foreign body response while maintaining a preocular tear film;
Increases the hydrophilicity of the lens surface to enhance spreading of mucin to cornea;
Imparts antimicrobial properties to the silicone.

It is anticipated that the characteristics of these hyaluronan enhanced silicones may also improve intraocular lens technology.
Hydrophilicity, optical transparency, protein absorption and monocyte adhesion data demonstrate the promise of these new materials for ophthalmic applications.

Institution

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