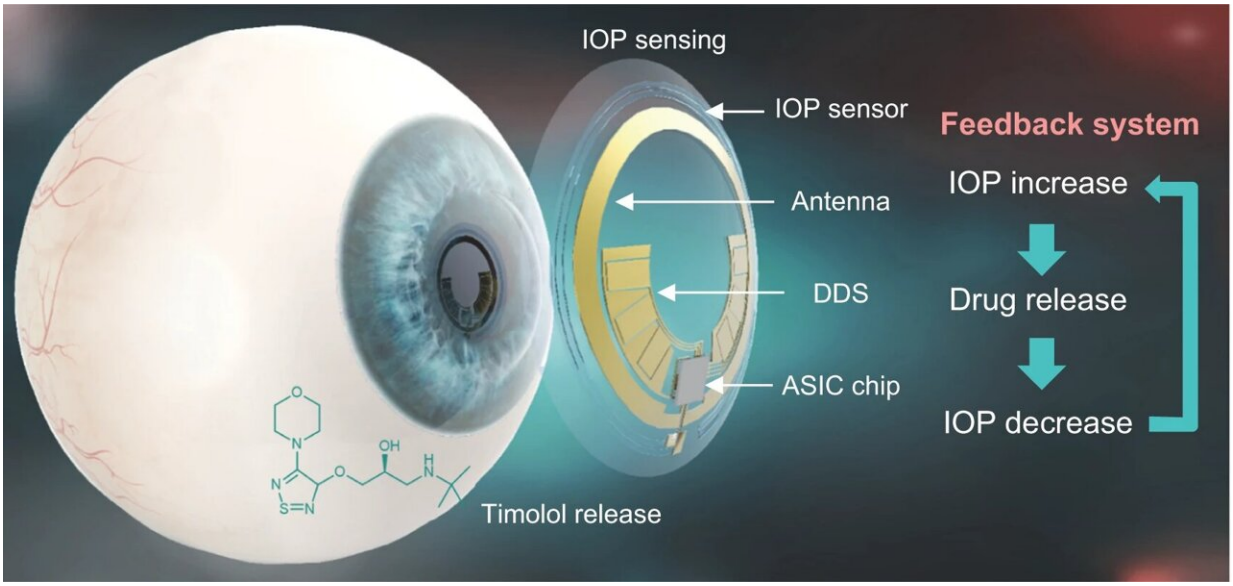
A smart contact lens that diagnoses and treats glaucoma

February 1 2023



Schematic illustration of a theranostic smart contact lens for glaucoma treatment. Credit: POSTECH

Glaucoma is a common ocular disease in which the optic nerve malfunctions due to the increased intraocular pressure (IOP) caused by drainage canal blocking in the eye. This condition narrows the peripheral vision and can lead to vision loss in severe cases. Glaucoma patients have to manage IOP levels for their life-time. Automatic monitoring and control of the IOP in these patients would significantly improve their quality of life.

Recently, a research team at POSTECH has developed a smart contact lens by combining an IOP sensor and a flexible drug delivery system to manage IOP measurement and medication administration.

A POSTECH research team led by Professor Sei Kwang Hahn and Dr. Tae Yeon Kim (Department of Materials Science and Engineering) has developed a wireless theranostic smart contact lens for monitoring and control of intraocular pressure in glaucoma. Their findings were recently published in *Nature Communications.*

The IOP sensors currently available for glaucoma patients do not have the function to administer the appropriate amount of drug in response to the IOP levels.

The smart contact lens developed by the research team has an IOP sensor that uses hollow nanowires made of gold. It is integrated with a flexible drug delivery system, wireless power and communication system, and an application-specific integrated circuit chip for both monitoring and control of IOP in glaucoma. Notably, the IOP sensor has exhibited high sensitivity to ocular strain, excellent chemical stability, and biocompatibility. Furthermore, the flexible drug delivery system can provide the on-demand delivery of timolol for IOP control.

The researchers successfully demonstrated that the theranostic smart contact lens enabled the IOP measurement in real-time and the appropriate amount of drug release to match the degree of IOP in rabbits with glaucoma.

The new smart contact lens is expected to make possible a personalized glaucoma treatment with maximum efficacy and minimal side effects. In addition, the feedback system would be applicable to various wearable devices other than smart contact lenses as well.

Professor Hahn who led this study commented, "We hope the early commercialization of the newly developed theranostic smart contact lens for diagnosing and treating glaucoma intraocular pressure to provide glaucoma patients' compliance."

More information: Tae Yeon Kim et al, Wireless theranostic smart contact lens for monitoring and control of intraocular pressure in glaucoma, *Nature Communications* (2022). DOI: 10.1038/s41467-022-34597-8

Provided by Pohang University of Science & Technology (POSTECH)

Citation: A smart contact lens that diagnoses and treats glaucoma (2023, February 1) retrieved 20 April 2024 from https://medicalxpress.com/news/2023-02-smart-contact-lens-glaucoma.html

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