Smart contact lens accurately monitors blood sugar in rabbits, human tests next

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Researchers say a smart contact lens was effectively able to monitor glucose levels and release medication in diabetic rabbits, and they plan to test it in humans sometime next year. File Photo by Ken Hurst/Shutterstock

April 24 (UPI) -- People with diabetes may soon have a new weapon as they battle to monitor their blood sugar -- their eyes.

An international team of researchers has found that a remotely operated, smart contact lens was able to effectively monitor blood sugar, or glucose levels, while also controlling drug delivery for the treatment of diabetic retinopathy, a common visual health condition associated with the disease.

The results of the tests, conducted with rabbits, were published Friday in the journal Science.

"A smart contact lens is especially promising for healthcare applications because it can be used as an excellent interface between the human body and an electronic device," co-author Dr. Sei Kwang Hahn, a visiting professor of chemical engineering at Stanford

University, told UPI.

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An estimated 100 million Americans are living with diabetes or pre-diabetes, according to the U.S. Centers for Disease Control and Prevention, and research suggests that as many as 30 percent of those with diabetes fail to adequately monitor and control blood sugar.

With further development and testing, the smart contact lens could prevent invasive blood tests for diabetes patients and potentially lead toward on-demand treatment of retinopathy and other eye diseases, Hahn said. Retinopathy leads to damaged blood vessels in the eye, and often causes vision loss.

Hahn and his colleagues argue that the corneal surface of the eye, where a contact lens rests, provides a unique and convenient window to monitor physiological changes throughout the body.

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Their lens is about 10 times thicker than a conventional contact lens and includes a real-time electrochemical biosensor, an on-demand flexible drug delivery system, a wireless energy transfer system and a remote radio frequency communication system.

The researchers inserted the lens into the eyes of live, diabetic rabbits and injected two units of insulin 15 minutes later to lower the rabbits' blood glucose levels. Then they monitored the changes, repeating the test after the lenses were stored for 63 days to demonstrate their ability to remain stable over time.

Following that, the researchers used the lenses to remotely release genistein -- a drug used to treat diabetes -- into the rabbits' eyes and measured the concentration in the cornea after one hour. They found that the lens delivered the drug as effectively as an eye injection.

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The researchers hope to begin testing a thinner version of the smart contact lens in humans no later than next year, and have an approved product commercially available by 2023. Their work has received funding from Samsung, among others.

"We are currently trying to reduce the thickness (of the lens) to enable people to wear comfortably all the time," Hahn said.