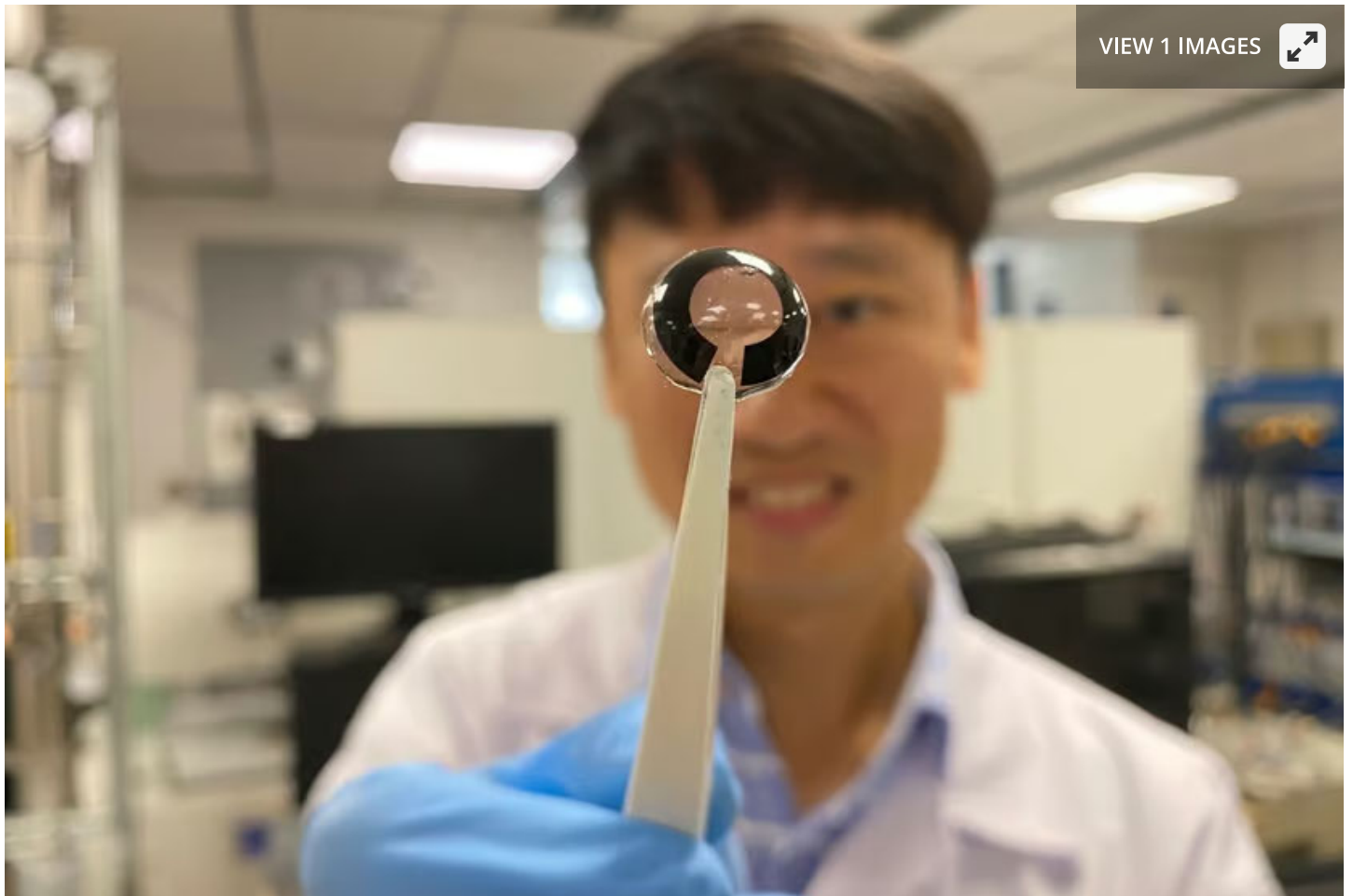




HEALTH & WELLBEING

Tear-charged glucose battery could power smart contact lenses

By Ben Coxworth
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VIEW 1 IMAGES

Assoc. Prof. Lee Seok Woo with a contact lens equipped with the prototype battery (black) Nanyang Technological University

Although great strides are being made in the field of "smart" contact lenses, one challenge remains – how do you safely and discreetly power the things? Singaporean scientists may have the answer, in the form of a tear-fluid-charged ultra-thin battery.

In recent years, we've seen electronically augmented contact lenses being developed for everything from [monitoring glaucoma](#) to [delivering eye medication](#) to [projecting](#)

[augmented-reality imagery](#) into the wearer's vision. According to a Nanyang Technological University team led by Assoc. Prof. Lee Seok Woo, however, the manner in which most such devices are powered is far from ideal.

"The most common battery charging system for smart contact lenses requires metal electrodes in the lens, which are harmful if they are exposed to the naked human eye," said Dr. Yun Jeonghun, co-first author of a paper on the study. "Meanwhile, another mode of powering lenses, induction charging, requires a [metal] coil to be in the lens to transmit power, much like a wireless charging pad for a smartphone."

The team's proposed alternative is a 0.5-mm-thin lens-integrated battery that incorporates water and a coating of an enzyme known as glucose oxidase. When the flat, flexible battery is immersed in the basal tear fluid that coats our eyes, the enzyme reacts with the sodium and chloride ions in that liquid, generating an electrical charge within the water in the battery.

In lab tests performed on a simulated human eye, the battery was able to produce a current of 45 microamperes and a maximum power of 201 microwatts, which the scientists claim would be sufficient to wirelessly transmit data from a smart contact lens for at least 12 hours. In its current form, the battery lasts for up to 200 charge/discharge cycles – by contrast, similar lithium-ion batteries typically last for 300 to 500 cycles.

Additionally, while the user's tear fluid could *help keep* the lens running throughout the day, the researchers do suggest that it be placed in a saline solution overnight (for at least eight hours) so it would start each day fully charged.

A paper on the study was recently published in the journal [Nano Energy](#).

Source: [Nanyang Technological University](#)

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