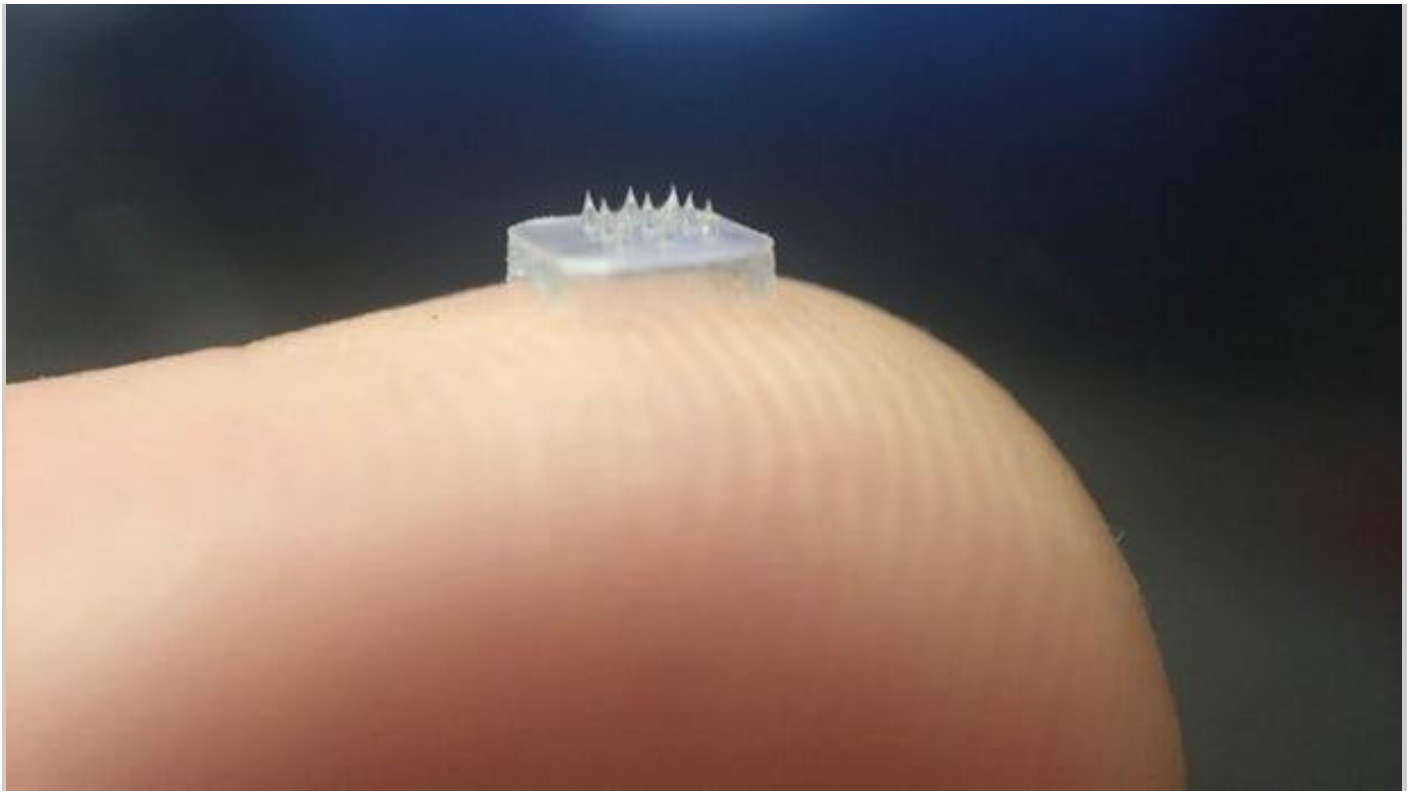
MEDICAL

Patch delivers medication by breaking needles off in the eye

Ben Coxworth | 2 hours ago



The eye patch measures 2 by 2 mm in its present form, and contains nine microneedles (Credit:NTU Singapore)

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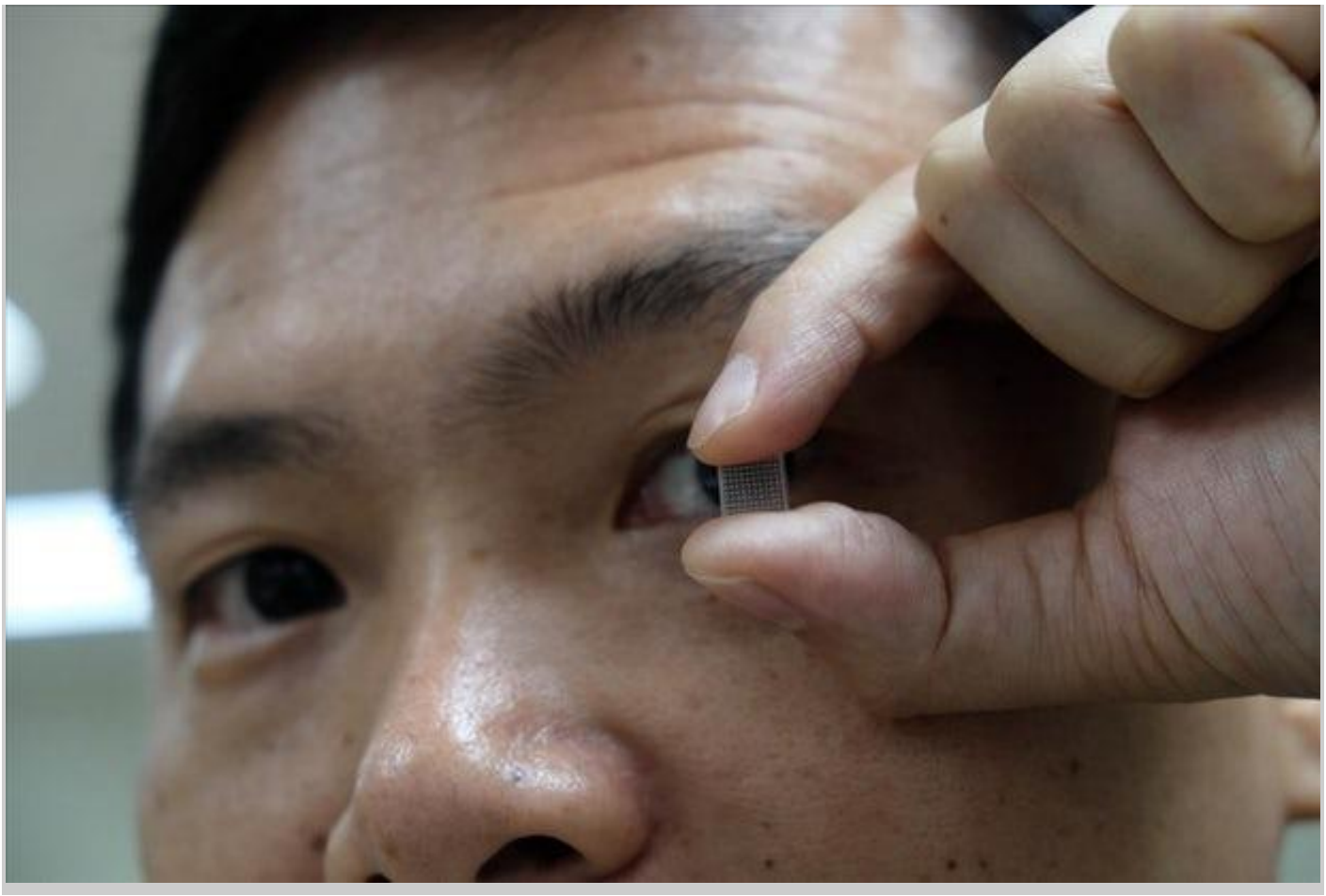
We've already heard about "microneedle" patches that near-painlessly deliver medication through the skin. Well, scientists at Nanyang Technological University, Singapore have now taken the same approach to treating eye diseases. They've developed a tiny patch laden with even tinier needles, which get poked into the eyeball.

While eye drops are the most frequently-used means of delivering medication to the eye, they have a problem – much of the medication simply gets washed out of the eye by tears. One alternative involves using hypodermic needles to inject medication right into the inside of the eye, although patients have to go to a clinic for each injection, plus of course it's not a pleasant procedure. Additionally, it can cause infections.

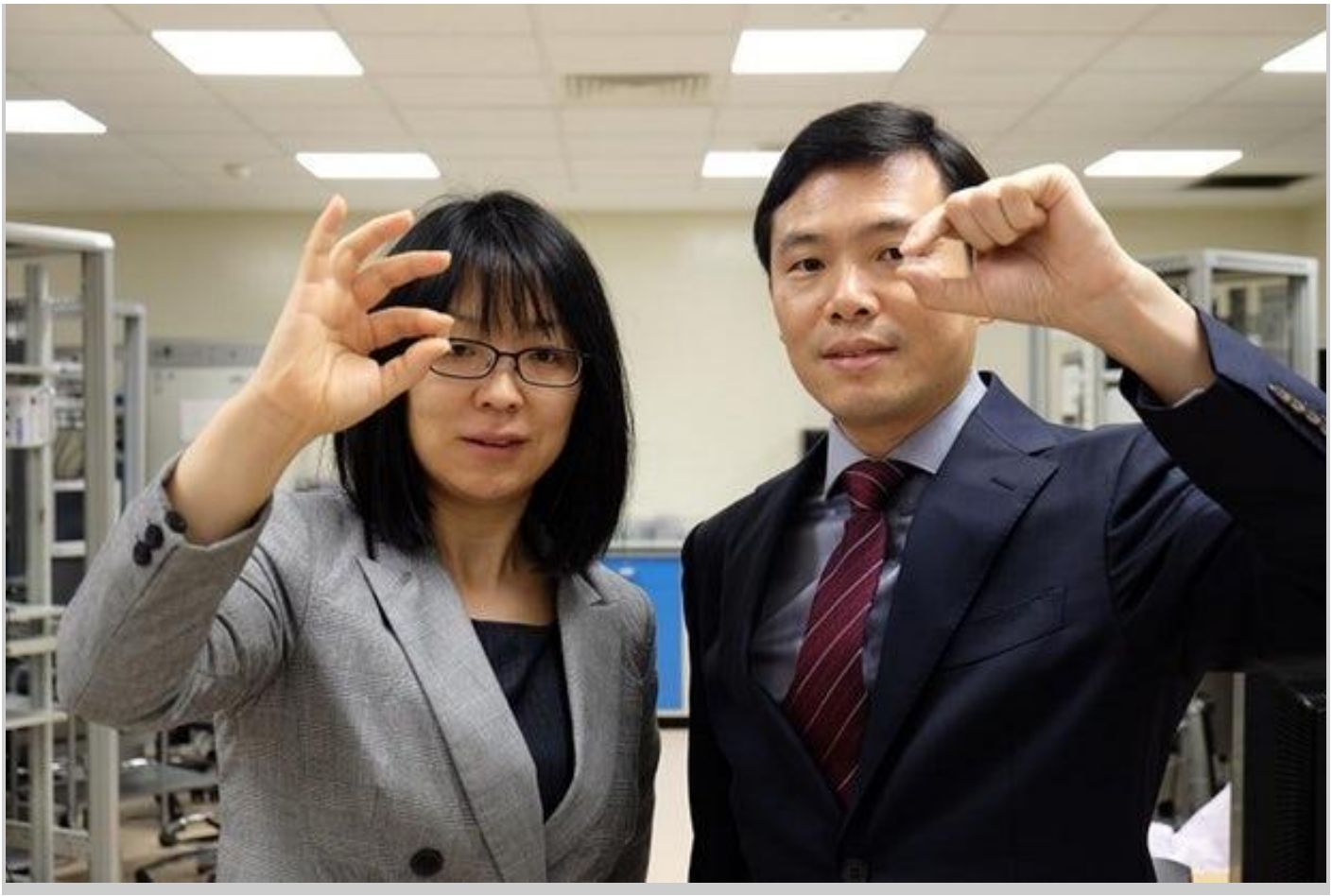
The NTU Singapore patch reportedly combines the painlessness and ease-of-use of eye drops with the effectiveness of injections. Developed by a team led by Prof. Chen Peng, it's made of hyaluronic acid, which is naturally found in the eye. The device measures 2 by 2 mm in its current configuration (a larger version is in the works, see photo below), and its underside contains nine tiny needles that can be loaded with medication. Each needle is thinner than a human hair, and is pyramid-shaped for optimal tissue penetration.



The patch simply gets pressed once against the cornea (the surface of the eye) and then withdrawn, apparently causing very little discomfort. When it's pulled away, however, the microneedles break off and remain in the outer layer of the cornea. They then proceed to slowly dissolve, gradually dispensing their payload of medication into the eye as they do so.

In lab tests, the technology has been used to deliver an antibody known as DC101 to mice with corneal vascularisation – this is a condition in which blindness can result from blood vessels growing into the cornea. After just a single 1-microgram dose, there was a 90-percent reduction in the area of blood vessels within the animals' corneas. By contrast, in a group of mice that received a single and much larger *10-microgram* dose of the medication in drop form, there was no significant reduction.

Additionally, one week after treatment with the patch, no puncture wounds were visible on the surface of the eyes.



"The microneedles are made of a substance found naturally in the body, and we have shown in lab tests on mice that they are painless and minimally invasive," says Peng. "If we successfully replicate the same results in human trials, the patch could become a good option for eye diseases that require long-term management at home, such as glaucoma and diabetic retinopathy."

A paper on the research was recently published in the journal *Nature Communications*.